ELECTRICAL REVIEW

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Domestic Heating

The Future Place of Electricity

PHYSICAL comfort in the home, being mainly a matter of eliminating cold and damp, there can be few things more worth their cost than warmth. In this country expenditure on this account represents a large proportion of the vast majority of incomes. Yet nowhere else is there so poor a return on outlay or so small a proportion of living space occupiable for any length of time in cold seasons. Further, this gross inefficiency is accompanied naturally by dirty atmospheric conditions. For the same overall consumption of coal, the Ministry of Fuel and Power Advisory Council sets out to show (as recorded elsewhere in this issue) that the amount of of heat could be doubled and smoke contributions to grey skies could be halved by measures that do not seem unduly drastic, viewed in relation to the evils that they would very greatly mitigate, not the least of which, socially, is the lack of facilities for obtaining adequate quantities of hot water.

Waste No Longer Tolerable

Paradoxically the present bad conditions are a heritage from an era, now vanished, in which the cheapness of good coal removed any stimulus to economy, whether in the construction of buildings in regard to heat insulation or in the design of the open fire (to which an efficiency of 20 per cent is generously ascribed) and the still more wasteful old-fashioned kitchen range. The backbone of the Report of the Advisory Council, which includes no member of the Institution of Electrical Engineers, though it took evidence from representative bodies in the electricity supply industry, is the proposal to install in all new houses and gradually in existing ones appliances designed for the efficient combustion of solid smokeless fuel to provide basic heat requirements. This does not mean "central heating," in which an almost constant temperature is maintained throughout the building (there are hygienic as well as economic arguments against this), but the reasonable warming of the living room, with simultaneous provision of hot water and the furnishing of background heating to other parts in the winter, leaving "topping up" and intermittent and summer services to electricity and gas.

Value of Competition

Food preparation would be carried out largely by the last two agencies, British cookers of either kind being considered probably the best in the world. The advantages to the public of keen competition between the two services is emphasized.

Without underestimating the possibilities of research in meeting the need for improved solid-fuel-burning appliances at a cost commensurate with present methods or of educational propaganda in regard to their proper use and maintenance or of a vigorous development of smokeless fuels, an allowance of twenty years for the complete fulfilment of the Council's aims seems certainly none too much. In what ratio the anticipated doubling of the proportion of heat supplied by electricity and gas is shared among them will, as the Report suggests, depend largely upon the skill of the managements in each

case. Elimination of bituminous coal from the domestic hearth, however, involves complex problems and the electricity supply industry, through its well established methods of using the less valuable grades of bituminous coals and through exploiting the convenience, cleanliness and labour-saving merits of its product, will doubtless within the next couple of decades build up a position that will ensure that any periods of "intermittent" use will be prolonged to the fullest possible extent.

Nuclear Energy

THERE is every prospect that electric power station practice will eventually be profoundly affected by the harnessing of nuclear energy as a means of generating heat. This was sufficient to justify the lengthy debate on the subject in the House of Commons last week. The opener, Lt. Col. Martin Lindsay thought that the Central Electricity Board's proposal to spend £300 millions on new plant in the next ten years did not "make sense." But in view of the uncertainty existing as to when atomic heat will be available for the purpose—estimates range from five to seventy years—there is abundant sense in the Board's programme. Any other course would mean starving industry of power, which is by no means plentiful at the moment, in a period when power for production means salvation to this country.

Highland Farms

FIRST-NAMED in the 1943 Act among the duties of the North of Scotland Hydro-Electric Board is the provision of supplies of electricity to ordinary consumers, including those in isolated areas. Farming problems there differ materially in many important respects from those dealt with in earlier investigations and the Board was well advised to call in the Electrical Research Association, whose Report is referred to in this issue. Although compiled for a specific purpose this Report contains a good deal of matter that should interest all concerned in agricultural electrification.

Nationalization in France

IN view of the discussions now proceeding here on the subject of nationalization of the fuel and power industries what is happening elsewhere in this matter possesses more than academic interest. Last week the French National Assembly passed by a large majority a Bill for the acquisition by the State of the country's gas and electricity producing and distributing undertakings. In Great Britain the importance of preserving the local contacts between suppliers and consumers has been emphasized; it seems to be the intention in France to attend to this point, for the maintenance of the identity of the regional production and distribution organizations is envisaged. Government stock will be allotted to the present owners as compensation for the loss of their properties; this will bear interest at 3 per cent "exclusive of taxation."

Synthetic Rubber

UNDER the stress of war conditions the United States built up a colossal synthetic rubber industry and is now faced with the problem of dealing with it. For some time the demand for synthetic rubber will persist, but when the rubber-growing industry of Malaya and the Dutch East Indies gets going again users will wish to revert to the natural material for many purposes. Nevertheless the United States Government has been recommended by an inter-departmental committee to keep about two-thirds of the industry in being. It is thought that a third of the country's rubber requirements can be met by synthetic material but plant capable of producing 600,000 tons a year should be maintained in a condition which will enable them to re-commence production should the necessity arise.

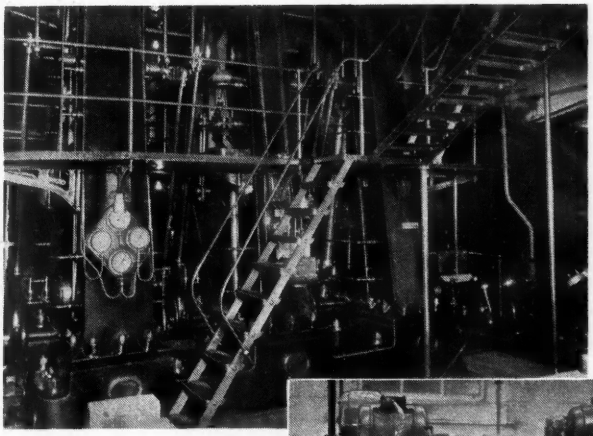
Promoting Overseas Trade

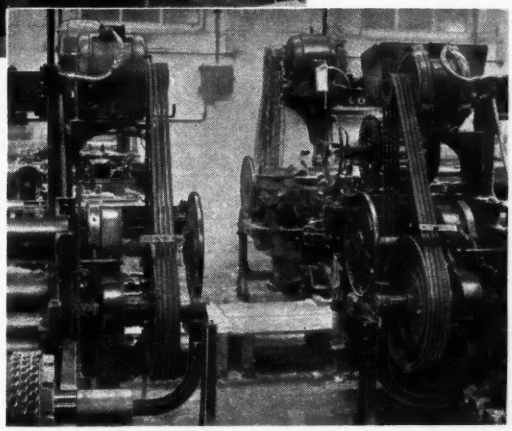
ON March 31st the Department of Overseas Trade ended an existence which, within limitations imposed by circumstances, has proved very useful to British exporters. The position of the Department between the Foreign Office and the Board of Trade had in some ways handicapped its activities. Its successor the new Export Promotion Department will not suffer under this handicap; it will be wholly under the Board of Trade, thus having only one master to serve. The new Department will afford all the facilities which the D.O.T. has hitherto made available but will presumably go much further in assisting exporters, implementing Mr. Attlee's promise that the new arrangements would improve the services which the Government renders to overseas trade.

Mill Modernization

Conversion of Drives at a Group of Textile Mills

IN the *Electrical Review* of February 15th and March 8th, an account was given of the electrical applications in the production of cotton cloth and the generation and distribution schemes at the three mills—Green Vale, Rock Nook and Sladen Wood (Littleborough), of Fothergill & Harvey, Ltd. An extensive programme of modernization of these mills is now at an advanced stage, and our purpose in this article is to describe some of the electrical conversion schemes embraced by this programme. One section of the Rock Nook Mill is at present driven by a triple-expansion vertical marine engine, which has been running for about fifty years. Work is now going on for its replacement by a number of motors; thus this major group drive will eventually be divided up into a number of sectional, but still group, drives.



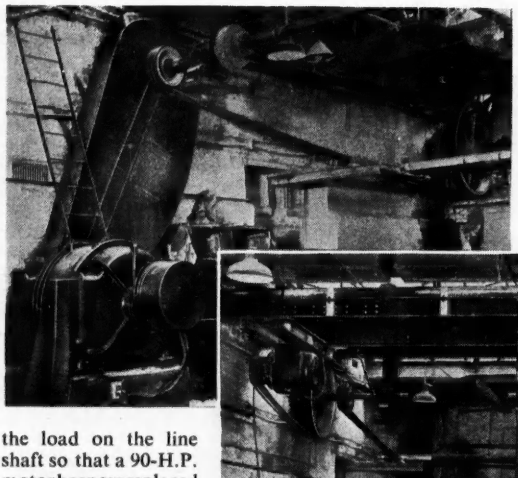


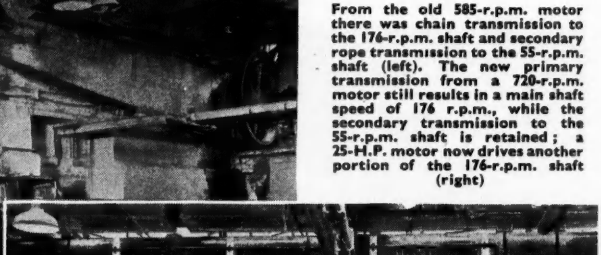
The triple-expansion engine (above) is being replaced by a number of sectional group drives. Right: Individual drives are being introduced in place of group drives where practicable: loom drives shown

The engine now drives the machinery on four storeys of the building, through cotton ropes in a vertical rope race at the northern end of the mill. The conversion schemes provide for a separate transmission scheme for each storey. The top storey, No. 4 room, will be served by a 250-H.P. 6·6-kV Metro-Vick slip-ring motor with a laminated V-rope transmission on to the existing line shaft. The speed reduction will be from 735 r.p.m. (motor) to 266 r.p.m. (line shaft), and from this line shaft about fifty ring-spinning frames will be driven. This motor is the first of its type to be used in these mills and its position is a long way from any substation. The e.h.v. cable to the Sladen Wood Mill, however, passes within a few feet of the motor position. The motor is controlled by a Switchgear & Cowans stator oil circuit-breaker and a Metro-Vick rotor-resistance regulator.

For the next storey, No. 3 room, the transmission scheme is similar. The machinery which is to be driven from the line shafting comprises twenty-nine ring frames, eleven roving frames and four

intermediate frames. In this case a 200-H.P. Lancashire Dynamo slip-ring motor (730 r.p.m.) is used. Transmission is through a Wigglesworth "Texrope" to a line shaft with a speed of 266 r.p.m. The pulley sizes are 13 in. and 35·2 in. and twenty 1¼-in. ropes are employed. This motor has an Allen West contactor type combined stator and rotor starter, and until recently it had been driving a weaving shed where the gradual conversion to individual drive of the looms has reduced the load on the line shaft so that a 90-H.P. motor has now replaced the 200-H.P. one.





From the old 585-r.p.m. motor there was chain transmission to the 176-r.p.m. shaft and secondary rope transmission to the 55-r.p.m. shaft (left). The new primary transmission from a 720-r.p.m. motor still results in a main shaft speed of 176 r.p.m., while the secondary transmission to the 55-r.p.m. shaft is retained; a 25-H.P. motor now drives another portion of the 176-r.p.m. shaft (right)

The two lower storeys, Nos. 1 and 2 rooms, are to be driven by 150- and 120-H.P. motors, respectively. Here again laminated V ropes are to be used and the original line shaft speeds have been retained. Each of these group-drive motors, with the exception of the e.h.v. machine, has a separate protective relay to prevent single-phasing, and this is considered to be essential in view of the fact that the main feeders are protected by h.r.c. fuses.

The change-over scheme necessitated very careful designing, because it is not possible gradually to take the load off the steam engine by changing one section of the transmission at a time, which would probably mean hand control of the engine on very light loads. Alternatively, it would not be possible to change all the transmissions over in a long week-end and be sure of maintaining production.

Consequently three of the new sectional schemes are so laid out that they can be completed and left with the motors disconnected, without disturbing the present cotton-rope transmissions from the steam engine. The fourth scheme can be completed in a normal week-end, when the remaining cotton ropes from the steam engine will be taken off, so that all four motors will be put to work at the same time.

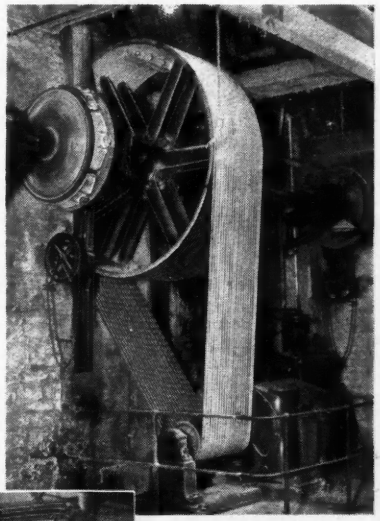
Owing to the various changes of plant and positioning of machinery over a number of years, together with a tendency to over-estimate the horse-power absorbed, a number of the motors installed on group drives are over-rated and the result has been rather poor installation efficiency and low power factor. The conversion scheme in hand, however, which embraces, apart from the completion of the electrification of the mills, the substitution of various motors in different positions, the splitting up of group drives, sometimes into two or more stages, and the conversion of group to individual drives, ensures that no motor is loaded at less than 80 per cent of its name-plate rating, thus considerably increasing the efficiency and power factor of the installation.

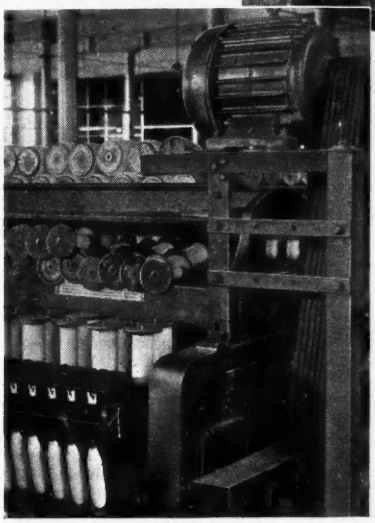
In the efforts which are being made to produce better working conditions a good deal is being done by way of increasing the spacing between the machines, and opportunities are being taken by the engineering department, where practicable and advisable, to introduce individual drives in place of group drives. In many cases, however, the group drive offers

the best service, and the choice very largely depends on the working characteristics of the machines to be driven.

In one case a 75-H.P. group drive for slashing machines and size-mixing equipment has been split up into three smaller drives, resulting in greater flexibility, because the whole of the shafting is not required for transmission purposes at certain times. From the old 585-r.p.m. motor there was enclosed chain transmission to a main line shaft with an actual speed reduction to 176 r.p.m., while a secondary cotton-rope transmission resulted in a second shaft running at 55 r.p.m. The main shaft has been cut, and one short section is now in use as an intermediate stage in the transmission scheme from a new 20-H.P. motor slung from the roof girders. This new motor runs at 720 r.p.m., and the first transmission still results in the original main shaft speed of 176 r.p.m. In this way it has been possible to retain the secondary cotton-rope transmission to drive the second shaft at 55 r.p.m. A second motor, similarly housed and of 25 H.P. (720 r.p.m.) now drives another portion of the 176-r.p.m. shaft via a similar V-belt transmission scheme. Further, two other machines, not always in use, have been separated from the original group and have been given a drive to themselves from a 15-H.P. motor through a third section of the original 176-r.p.m. shaft, by cutting this shaft a second time.

In another instance a series of winding frames were each driven by a spur-geared motor with further transmission to the frames by belting. Much smoother and quieter running has been imparted to these frames by the substitution of 4-H.P. motors with straight V-belt transmissions, giving an actual speed-reduction ratio of 960 to 136 r.p.m. Another change-over scheme relates to a group drive for 160 looms and represents an intermediate stage in the conversion from steam to full electric drive. In this case a 90-H.P. motor replaces the 200-H.P. motor referred to in connection with the change-over scheme from the steam engine, which is being used again. In this transmission scheme the line shaft runs right through a sleeve to which the transmission pulley is fixed, and by means of a friction clutch the shaft can be locked with the sleeve. In this way, with the shaft running free a drive can be taken from the steam engine, or with the shaft locked the load can be taken by the motor.

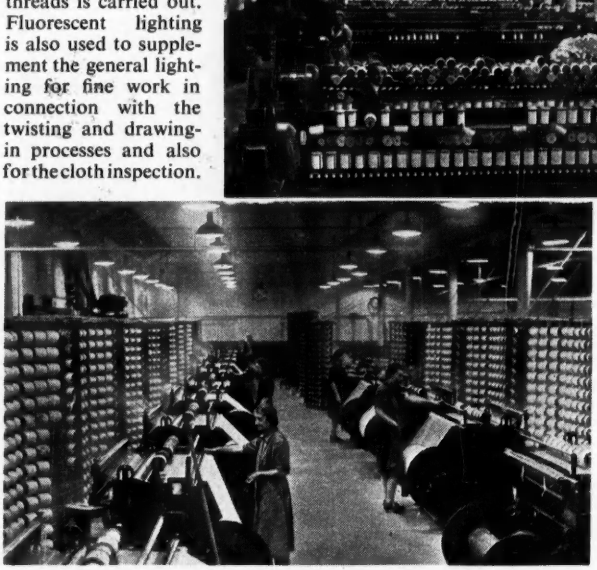




Smoother and quieter running is secured for the winding frames (left) by the replacement of spur-geared motors by motors with V-belt transmissions. The above group drive for 160 looms represents an intermediate stage in the conversion from steam to full electric drive

All the above improvements have reduced the power costs and electricity consumption. The re-lighting of the mills, however, is well in hand, and this alone constitutes a very considerable load. For

the general lighting with ground-glass visors are used, but diffusive-type reflectors are being employed where even lighting is required without shadows, e.g., where work on fine threads is carried out. Fluorescent lighting is also used to supplement the general lighting for fine work in connection with the twisting and drawing-in processes and also for the cloth inspection. dispersive reflectors and tungsten lamps mounted in straight rows 10 ft above the floor, with 10 ft by 13 ft spacings.



Above: Improved general lighting in the winding room. Left: "Colour-scheme" lighting in the beaming room. Both of these photographs were taken with normal artificial lighting

A typical example of the improved general lighting provided in the mill is the installation in the winding room which is equipped with 300-W R.L.M. fittings mounted at 12 ft above floor level and spaced at 10 ft by 14 ft in staggered formation.

Colour Schemes

Careful consideration has been given to, and expert opinion obtained on, the colour schemes employed in the decoration of the workrooms. An example of this is the beaming room in which the walls are coloured a deep primrose above a 4-ft band of blue at the bottom, and the ceilings are coloured light primrose. The idea behind this is that when the operatives look away from the white yarn on which they are working their eyes are rested by the pastel shades of the colour scheme.

For the lighting in this room R.L.M. fittings are employed, with 200-W lamps,

We are indebted to Fothergill & Harvey, Ltd., for permission to visit the Sladen Wood Mills, and to publish this and the two earlier articles referred to, and to Mr. A. W. Berry, chief engineer, and Mr. N. Eastwood, A.M.I.E.E., electrical engineer, for their help in collecting information and taking photographs.

Cable Ratings

CURRENT rating of power distributing cables is dealt with mathematically in a paper by MR. C. C. BARNES presented to the London Students' Section of the Institution of Electrical Engineers.

The author explains in the paper how the heat flow formula has to be expanded in practice to include skin and proximity effects as well as losses in dielectric and lead sheath. The manner in which the thermal resistance of the heat flow path is computed is indicated, geometric factors being utilized in place of the logarithmic part of the formula employed for this purpose because it is difficult to apply rigid mathematical treatment to the case of multi-core cables.

Different methods of laying cables are discussed and the effects of grouping cables indicated.

Northmet Station Inquiry

Rye House the Only Suitable Site

AN inquiry was held last week by the Electricity Commissioners and the Ministry of Town and Country Planning into the application of the North Metropolitan Power Station Co., Ltd., for permission to build a £5,000,000 power station at Rye House in the Lea Valley. The Herts County Council and Hoddesdon Urban District Council are raising objections on the grounds that it would spoil the neighbourhood under the Abercrombie plan. Representatives of the local Angling Society, the Ratepayers' Association and other organizations supported the Councils. Sir Cyril Hurcomb and Mr. H. Nimmo for the Electricity Commissioners and Mr. R. T. Russell for the Ministry formed the tribunal.

Mr. Craig Henderson, K.C., for the Power Station Company, said it was not denied that a power station was needed in the area. Electricity demands since 1939 had gone on increasing and at present were in the neighbourhood of 400,000 kW. These had been met by importing from other areas and there was now an undue importation. The Rye House site was the only one suitable for a power station which required ample space, ample water and coal supplies and proximity to the load to be supplied.

No Objections at Time of Purchase

When the Hoddesdon U.D.C. was first approached regarding the site the company was told that it was destined for industrial development. The land was purchased by the company in 1942 and in 1944 the Ministry stated that there was no objection on planning grounds. In 1945 the company lodged a formal application for permission to build the station and was refused by the District Council, which quoted a Ministry circular saying that there should be no departure from the Abercrombie plan.

After the formal refusal the company in February decided to appeal to the Minister and the sequel was the ordering of this inquiry. Mr. Craig Henderson declared that before a local authority could refuse an application it had to be satisfied that other land was available. There had been no suggestion of other land in this case. Furthermore the Abercrombie plan was not law, and while the Government had given its general approval to the plan, it had been indicated quite clearly by the Minister that the report was not accepted in full.

Mr. W. N. C. Clinch, chief engineer and general manager of the company, said they proposed to erect large cooling towers and three steel chimneys each 300 ft high. The greatest attention was being paid to the effect the station would have on the neighbourhood and the plans would be submitted to the Royal Fine Arts Commission for suggestions. It was essential to meet the increasing electricity demands coming in particular from the new area of Stevenage in the north with a new plant. Professor Brunt, of London University, estimated that the dust deposit would average less than 0·35 mg per cubic metre.

Urging the preservation of "Isaac Walton's river" for anglers, Mr. Baxter, representing the London Angling Society and the Lychnobite Angling Society, said that a generating station would destroy all amenities essential to the angler. On behalf of the Council for the Preservation of Rural England, and the Broxbourne Ratepayers' Association, it was stated that 89 per cent of the public did not want the station. The Ratepayers' Association thought that it would be the beginning of heavy industries in the area and would destroy amenities and property value. Mr. H. R. McDowell, for the Metropolitan Water Board, said that the station would affect the water supply, but the Board would not press the case if the station was found to be necessary.

Mr. Arthur Capewell, K.C., opened his case for the Herts and Hoddesdon Councils with a plea that the power house would adversely affect market gardening in the area.

Mr. C. H. Aslin, chief architect to Hertfordshire Council, complained that the plans showed little regard for architectural design and lacked appreciation of what was required. There was no uniformity, and the station would be a blot on the landscape. The Royal Fine Arts Commission, to whom it had been suggested the plans should be submitted, would simply reject them as being of no architectural value.

The tribunal will announce its decision as soon as possible.

Petersen Coils

AT a recent informal meeting of the Institution of Electrical Engineers, MR. H. WILLOTT TAYLOR spoke of his practical experience of arc-suppression coils of the Petersen type for power distribution lines, while MR. L. B. S. GOLDS dealt with relays and instruments used in conjunction with such coils.

The balance of opinion expressed during the general discussion which followed favoured the utilization of such coils and the suggestion was made that the Electricity Commissioners should now recommend their use.

The necessity for "tuning" the coils accurately was emphasized, although it was not possible to "time" present designs while a fault was being "held" on the line. The American practice of inserting lightning arrestors across the Petersen coils was growing.

Views on the News

Reflections on Current Topics

PROBABLY in no other developments connected with the waging and winning of the war were such advances made as in the field of short-wave radio and radio-location. The importance of this work was fully brought out at last week's Convention at the I.E.E. when many of the men prominent in this sphere gave accounts of their particular contributions to the remarkable achievement. Sir Robert Watson-Watt's introductory address contained some noteworthy facts and figures, especially those indicating the tremendous expansion of the radio industry to meet war needs—a six-fold growth measured by the value of output. It was pleasing to hear a tribute paid to British scientists by Dr. Llewellyn, the president of the Institute of Radio Engineers of America, who came from the United States for this special purpose.

* * *

Objections have been raised against the erection of the new Kingston-on-Thames power station. The site is by Canbury Gardens, a pleasant walk by the side of the Thames, and the opponents of the station fear that the appearance of the place will be adversely affected and that nuisance will arise from smoke and grit and from the coal-handling plant. In point of fact the building will be quite a handsome one and no doubt due precautions will be taken against chimney emissions and coal dust troubles. But the objectors are too late. The station was planned before the war and I found the other day when I visited the site that not only are the foundations well in hand but a good deal of the structural steelwork is already in position.

* * *

Plans drawn up for the new headquarters in the City of London of the Institute of Marine Engineers promise a memorial worthy of the 3,500 technical officers who lost their lives during the war. Upon their successors will fall most of the brunt of maintaining the international reputation of this country's mercantile marine and the Institute is known to be actively concerned in their training. With increasing electrification much more needs to be done to attract men of the right calibre with the requisite qualifications by offering them opportunities of reaching the highest positions. Mr. G. O. Watson of Lloyd's has pointed out (*I.E.E. Journal*, January, 1945) that, with the possibility of legislation affecting the mercantile marine, electrical engineers must be ready with constructive proposals if they are not to miss the tide—possibly in more than one sense.

* * *

The fact that it is considered selfish to use an electric iron emphasizes the sorry state of affairs that has been prevailing for a long time at the Wood End Park Estate, Hayes. I refer of course to those distant days when electricity was available at all—since January supplies have been cut off altogether. It is good to know that agreement was reached last week between the parties involved in the Court case which developed as a result of this situation, but the matter cannot be allowed to rest there, and it is to be hoped that the recent publicity will accelerate the only satisfactory solution of the problem, the provision of a public supply from the authorized local undertaking, the Metropolitan Electric Supply Co. This company is anxious to play its part in overcoming the difficulties, which hinge largely on the question of ownership of the estate, a matter which has been clarified somewhat by the evidence given in court.

* * *

A big market for infra-red lamps in the home is foreseen by an American firm which is introducing a 250-W unit complete with a reflector costing only $1.60. Apart from its more conventional medical uses for the relief of pain, the " hundred-and-one " applications of this versatile lamp include, it is claimed, heating the bathroom, chicken coop, etc.; drying hair, films, nail varnish, laundry and paint; removing paint and putty; defrosting the refrigerator; thawing out pipes; warming up the car engine; and—supreme achievement—de-fleaing dogs !

* * *

Every week I come across reports of deaths from electric shock caused by ignorance or carelessness. A probable example of the former is the case of a nurseryman who was found dead in a greenhouse with a pair of pliers in his hand and a pair of severed wires nearby. Another involved the death of a man through a radiator falling into his bath. Electricity supply authorities should consider it a duty to dispel ignorance in these matters and warn against carelessness. I know that some of them already do this but many feel that they are likely to scare people away from electricity if they are too insistent upon safety. All this has been said before, I know, but repetition now and again is justified.

—REFLECTOR.

Electro-Metallurgical Progress

Heat-Treatment, Welding and Plating

By L. Sanderson

RECENT developments in heat-treatment include a box-type unit for applications necessitating temperatures up to 1,090 deg C. It is designed to harden steels to 1,010 deg C and also to temper parts that have been heat-treated. Dimensions of the largest size are 54 by 88 by 102 in. Readily interchangeable heating elements are made from an alloy containing 80 per cent nickel and 20 per cent chromium and are operated at a maximum density of 10 W per sq. in. A heat-treatment plant for steel washers comprises a small sloping conveyor projecting into a quenching tank and driven by a variable-speed motor. This conveyor has an induction heating coil through which the washers pass before they fall into the water.

Tests have been carried out in which a small electric heat-treatment furnace was maintained at 650 and then at 870 deg C by an on-off control connected to a thermocouple with the object of comparing the speeds of response when the thermocouple was protected by a special transparent glass, by stainless steel and by a sillimanite tube. The response with the glass was at about three-quarters of the speed obtained with no protection; sillimanite caused the slowest response.

Electrode-raising Arrangement

Flywheels have been embodied in arc-furnace control to enable the electrodes to be automatically lifted from the bath if a.c. supply is shut off; auxiliary d.c. generators make the controls self-contained. In a new method of control constant sensitivity from full-load arc current down to 10 per cent rated current is given by maintaining strong generator field values throughout the complete range.

A cylindrical rocking resistor single-phase furnace has been applied to the refining and superheating of high-duty cast irons. Power consumption is 150 to 180 kWh per hr. with up to 5,000 A at a voltage variable between 32 and 61. About 1,000 lb of cold pig iron and scrap can be heated to 1,450 deg C in 2 hr., using about 400 kWh.

Induction-heating plant includes low-voltage heavy-current equipment operated at supply frequency, motor-generators producing frequencies of from 1,000 to 12,000 cycles per sec., spark-gap oscillators for frequencies up to 300,000 cycles and vacuum-tube oscillators with frequencies in the 100,000 to 5,000,000 cycle range. Spark-gap convertors with high-frequency motor generators are economical for heating small parts up to 1½ in. diameter, for melting on a small scale in the laboratory and, in general, for work requiring frequencies between 12,000 cycles and radio frequencies supplied by tube convertors.

Choice of Frequency

Factors affecting the choice of the right frequency, current input and time cycle for induction hardening of metals have been investigated, with particular reference to 9,600 cycles, which has a wider range of application than other frequencies. A simple guide to the choice of the lowest possible frequency for round bars above a magnetic permeability of unity is the equation $F = 180/R_2$, where F is the frequency in cycles per second and R the radius of the bar in inches. The interval between the end of the heating period and the beginning of the quench is a most important control factor. Increasing this interval gives additional time for heat penetration and carbide solution and may be employed instead of increasing the power or current time. By electronic control the speed of a 2-H.P. winding-reel drive that pulls steel strip through a continuous annealing plant has been exactly regulated within 3 to 12 ft per min.

A new development in arc welding is the employment of mild-steel-core wire electrodes with a heavy metallic coating containing the alloying elements. By this means a variety of properties far in excess of that for ordinary high-speed steel deposits can be achieved and care can be taken that the fundamental requirements of hot hardness and abrasion resistance are fulfilled.

Movements of cutting torches on contour work on steel plate can now be controlled by plastic records on drums which convey the prescribed curves to the driving gear by a scanning device containing photo-electric

cells. The records are prepared by placing a drawing on the steel plate. A pointer, substituted for the burning torch, is guided by push-button control along the curve to be cut, and a recording is made of the actions of two driving motors needed to follow the desired contour.

A metallizing bonder has been developed for depositing electrode metal, setting up a firm bond between the surface and the sprayed metal. A simple, one-dial control allows of a wide choice of current, and the nozzle permits of easy regulation of the electrode to any length. The density of the metal deposit is controlled by modification of the air pressure.

Methods of depositing a machinable chromium coating on steel have been investigated. The presence in the chromium plating solution of considerable quantities of a trivalent metallic ion increases the cathodic current efficiency of chromium deposition at high temperatures, and also permits the production of a soft machinable deposit over a wide range of current density. Examples of suitable trivalent ions are iron (15–30 g/l) and chromium (15–30 g/l). Aluminium is also efficacious, and is best added as the hydroxide.

Wear Resistance

Tests for determining the best method of producing wear-resisting chromium plating have shown that when an electrolyte containing 150 g of CrO_3 and 1·5 g of H_2SO_4 per litre of water was used at 50 deg C with a current density of 40 A per sq. in., the wear resistance increased with improvement in the octahedral texture of the deposit as revealed by X-ray examination. For uniform thickness over the entire surface of the bath, the anode must be closer to the cathode at the bottom of the bath than at the top. A continuous plant for tinning steel strip up to 38 in. wide at speeds up to 1,350 ft per minute has been installed; a halogen electrolyte is used.

With the increased power of X-ray apparatus, fluorescent screens have been replaced by intensifying screens of lead foil, 0·005 and 0·01 in. thick. To prevent these from being pitted, wrinkled or creased, the thin lead foil has been mounted on a sheet of unwanted film from the record files.

A magnetic sorting bridge, the Salford, comprises a couple of balanced coils and an amplifier with a cathode-ray oscillograph portraying the hysteresis loop of the part under test. Its first function is to make sure that the part tested has the desired properties before any work is carried out on it, and its second to ascertain whether the properties have been altered by the process of manufacture. A master part with the desired properties is placed in one coil, and the part to be tested in the other. Differences in the properties are easily detected by changes in the form of the loop.

Discharge Lamps

Photometry and Colorimetry Apparatus

THE problems involved in, and new forms of apparatus for, the photometry and colorimetry of tubular fluorescent and other kinds of discharge lamps are dealt with in some detail in a paper presented (in lecture form with lantern slides and demonstrations) by MR. G. T. WINCH to the Illuminating Engineering Society, the methods described being suitable for standardizing laboratories as well as for commercial determinations.

Multi-observer visual methods are laborious; instead photocell and filter combinations have been developed for measuring lumens. They approximate to average eye response, although more accurate results can be achieved by the dispersion and mask method.

A new design of instrument is described which has the great advantage of being adaptable as a multi-purpose apparatus on which in quick succession measurements of lumens, colour and luminosity in spectral bands can be made. The same apparatus is suitable for measuring spectral distribution of light sources, spectral and integral transmission of colour filters; also directly the tri-chromatic coefficients of the light transmitted by such filters.

Errors may arise when normal dynamometer measuring instruments are used. These difficulties are readily overcome by the use of a thermionic wattmeter, ammeter and voltmeter having a high input impedance. The light output is also influenced by the lamp characteristics and the precautions necessary when measuring the various types of lamp are detailed.

Photometric integration problems have arisen due to the size and shape of tubular fluorescent lamps which have been solved by special techniques, and box-type integrators painted with grey instead of white integrator paint have facilitated commercial measurement of the luminous efficiency of these lamps.

Brief reference is made to errors which arise when measuring illumination from tubular fluorescent lamps at low mounting heights due to their size and departures from true cosine response of selenium rectifier photocells or test plates. Description of the colour of fluorescent lamps by a colour temperature is misleading in certain cases, and therefore this method of specification is in general deprecated.

Domestic Fuel Policy

Advisory Council's Report

IN connection with the Government's housing programme the Advisory Council to the Ministry of Fuel and Power (chairman, Sir Ernest Simon) was asked to consider the use of fuels and the provision of heat services in domestic and similar premises with special regard to efficient use of resources and the prevention of atmospheric pollution. The Report now presented indicates how the data given in the Egerton Report (Ministry of Works Post-War Building Studies, No. 19, see *Electrical Review*, January 25th) can best be applied. Comfort standards of space and water heating are based on a study by Professor James MacKintosh, M.D., given as an appendix. All rooms should be capable of being kept continuously at not less than 45 to 50 deg. F. with facilities for topping up to 65 deg. Water at 140 deg. F. should be available at bath, basin and kitchen sink to an amount of 250 gal. per week.

Present types of open coal fire are criticized as not more than 20 per cent efficient and involving needless structural expense; e.g., on 1938 figures, the cost of a flue is £25 for a two-storey house and of storing each ton of coal £5, giving a figure for maintenance and amortisation of 8d. per week. The old-fashioned kitchen range is worse and its efficiency, including hot water supply, is only about 7 per cent. Many types of efficient solid-fuel heating appliances are said to be now available with efficiencies of at least 40 per cent.

Improved Solid-Fuel Appliances

It is recommended that the Government should encourage the mass production of improved heating appliances (especially those capable of burning both bituminous and smokeless solid fuels) to prescribed standards as confirmed by a type-testing station and that only such should be ultimately permissible. The adoption of Codes of Practice for heating and ventilation installations should be made a condition of subsidy for new houses, and consideration should be given to a free issue of approved solid-fuel appliances as part of the subsidy. Subsidies should also be granted for the replacement of old-fashioned coal grates in existing houses. Available supplies of smokeless solid fuel should be burnt in individual houses, leaving bituminous fuel, which cannot now be consumed without smoke in small stoves, for central heating plants in blocks of flats and single large houses.

Before the war 86 per cent of domestic total heat requirements was met by solid fuel, 10 per cent (half its total market) by gas and 4 per cent by electricity (one-quarter of its total market). During the previous decade, however, domestic sales had been increasing annually by 20 per cent per annum for electricity and 1½ per cent for gas. It is held to be economically impracticable for electricity or gas to take the winter space heating load on the grounds that this would entail great extensions of plant which would be idle in summer and that solid fuel costs half as much and entails the use of about half as much coal. Further, if one ton of solid fuel were stored per house during the summer, this would even out the winter and summer demands on the mines; storage capacity can be provided economically at gas works for only one or two days' supply and not at all for electricity in large quantities.

Cooking and Water Heating

There are, the Report states, 9 million gas cookers and 1¼ million electric cookers installed, but more competition is to be expected from new designs of solid-fuel cookers when these become less expensive. In addition water-heating is now furnished by gas as to 15 per cent and by electricity as to 5 per cent of the total. By another twenty years the proportion of the total domestic market captured by electricity and gas is expected to have risen to 30 per cent of the total, the division between them largely depending on tariffs in the two industries. Although solid fuel is recommended as the means for furnishing winter space and water heating, with electricity or gas providing intermittent demands for short periods, there remains a large field for free competition in cooking and for water and space heating at other seasons. These considerations apply generally to thinly-populated rural areas to which electricity (but not gas) mains should be extended so long as this does not throw excessive burdens on consumers elsewhere.

Keen competition between gas and electricity has, it is emphasized, led to increased

activity in research and development, improved service to consumers and low prices, but prices charged should be closely related to cost of production and distribution.

In regard to conserving the heat produced in houses, in view of the inconstant climate of Great Britain, space heating is required only intermittently for the greater part of the year. Ceiling and wall linings should therefore be of low heat capacity, to enable a room to be warmed quickly, and of low heat transmittence. A solid-fuel appliance with flue (except where central heating is used) should be provided by the building owner in the living room of each house, to give background heating for flueless bedrooms by convection or radiation and to heat water. Means for warming one bedroom by electricity or gas should be provided. Electric points should be installed in the main rooms and gas connections in rooms with flues. Storage for one or two tons of solid fuel would be required. Modern solid-fuel equipment is briefly described.

It is estimated that adoption of the full Egerton standards in a post-war 900 sq. ft. house will call for twice the amount of useful heat provided in the pre-war house occupied by families with incomes of under £250 per annum. A heating installation on the lines described will require about 3 tons of solid fuel per annum and the equivalent of a further ton for electricity or gas. That is roughly the same amount of coal as was consumed in a similar pre-war house, but at an efficiency of 40 per cent as against an average of 20 per cent for the old installation.

Other recommendations made are that research and development should be expanded in the next few years in relation to adequate, efficient, economical and smokeless domestic heating, in association with large-scale trials by the Government; that information centres and showrooms should be set up in London and large towns; that the education of housewives by the Fuel Efficiency Directorate of the Ministry should be continued; and that legislation should be passed to enable smokeless zones to be established. In conclusion it is stated that a national fuel policy should secure that the 50 million tons of bituminous fuel now burnt should be replaced within twenty years by smokeless solid fuel or by electricity or by gas. The result would be the virtual abolition of domestic smoke and reduction of labour and dirt in the house. It would also double the useful heat in the smaller house at little or no greater cost to the householder without increasing the consumption of coal or else it would increase the useful heat by 50 per cent with a saving of 10 million tons of coal each year.

Forthcoming Events

Saturday, April 6th.—*West Hartlepool.*—Railway station, 2.15 p.m. I.E.E. North-Eastern Centre (Students' Section). Visit to works of Messrs. Richardsons, Westgarth, Ltd., West Hartlepool.

Monday, April 8th.—*Cardiff.*—Institution of Electrical Engineers. I.E.E. Western Centre. "Operational Maintenance and Testing of Overhead Lines and Associated Outdoor Equipment on A.C. Systems," by R. C. Hatton and J. McCombe.

Tuesday, April 9th.—*London.*—South-East London Technical Institute, 8 p.m. Electrical Engineering Society. "Structure of Matter," by E. L. White.

Institution of Electrical Engineers, 3 p.m. Institute of Petroleum. General discussion. "Transformer Oil."

Manchester.—College of Technology, 7.30 p.m. I.E.E. North-Western Centre. Faraday Lecture, by Dr. T. E. Allibone.

Wednesday, April 10th.—*London.*—Savoy Hotel, 12.30 for 1 p.m. British Plastics Federation. Twelfth annual luncheon.

Institution of Electrical Engineers, 5.30 p.m. I.E.E. Transmission Section. "Rural Electrification—Use of the Single-phase System of Supply," by J. S. Pickles and W. H. Wills.

Edinburgh.—Heriot-Watt College, 6 p.m. I.E.E. Scottish Centre. "Street Lighting," by E. C. Lennox.

Thursday, April 11th.—*London.*—Institution of Electrical Engineers, 5.30 p.m. I.E.E. Installations Section. "Coreless Induction Furnaces," by M. J. Marchbanks.

Manchester.—Engineers' Club, Albert Square, 6.30 p.m. Women's Engineering Society (Manchester Branch). "Electric Motors—Design for the Job," by Miss D. Smith.

Taunton.—Electricity Department Theatre, The Parade, 3 p.m. I.E.E. Devon and Cornwall Sub-Centre. Joint meeting with Western Centre (Installations Group). "Some Factors affecting the Design of Electric Lighting Installations for Building Interiors," by R. O. Ackerley.

Friday, April 12th.—*Newcastle-on-Tyne.*—Neville Hall, Westgate Road, 6.30 p.m. I.E.E. North-Eastern Centre (Students' Section). Annual general meeting and film show.

Manchester.—Engineers' Club, Albert Square, 6 p.m. I.E.E. North-Western Centre (Radio Group). "New Methods for Locating Cable Faults particularly on High-frequency Cables," by F. F. Roberts.

Saturday, April 13th.—*Leeds.*—Electricity Department Offices, Whitehall Road, 2.30 p.m. I.E.E. North Midland Centre (Students' Section). "Variable Speed Polyphase Induction Motors," by H. Moorhouse and F. W. Walker.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

D.C. to A.C. Change-over

MUNICIPALITIES and supply companies have been generous and efficient in their change-over transactions, often modifying plant and paying compensation beyond their statutory obligation.

Since the elimination of public supplies of direct current is technically desirable it seems likely that D.C. to A.C. change-over will continue after nationalization of the electricity supply industry. Obviously, the working man's radio receiver will be converted free of charge but will the small manufacturer obtain fair treatment? It is not difficult to visualize the bureaucratic chaos that would envelope financial compensation, if indeed, such compensation is to be paid to exponents of private enterprise.

G. T. SPEARS,
Graduate, I.E.E.

London, N.14.

Farmhouse Heating

YOU referred in your issue of March 22nd to an address I gave to the Wigton branch of the N.F.U. where I was incorrectly reported in the local press as saying that I did not think "that at the moment electricity could be used as economically as coal for heating."

My actual words were "as economically as solid fuel for heating the large farm kitchen." Owing to the operations carried out in the average large farm kitchen which require a continuous supply of heat and the fact that the doors are seldom closed for long it is difficult to justify the installation of electric space heating. The case for space heating, however, could be justified if the kitchen were of modern design.

Cockermouth. R. E. GAMLEN,
District Manager,
Mid-Cumberland Electricity Co., Ltd.

I.E.E. Papers

IN your issue of March 29th the chairman of the I.E.E. Installations Section is reported to have complained that too few members seem ready to submit papers and "Reflector" suggests a number of reasons for this state of affairs. One reason not mentioned which I think has some bearing on the subject is that the standard of I.E.E. papers generally, both as read and as contributed to the *Journal* shows an increasing tendency to be scientific rather than technical and to deal with research rather than utilization. As a result there is a somewhat natural reluctance on the part of ordinary members engaged merely in applications of electricity to come forward and describe their own very mundane experiences—such hardly seem involved enough to merit discussion by physicists and other scientific workers.

A case in point is a lecture on "Recent Developments in the Electrical Propulsion of Ships," prepared by a former chairman of the Installations Section, which is shortly to be delivered before the Mechanicals. This is just the sort of interesting paper dealing with an application of electricity which would be appreciated by many in our Institution and would probably provoke a lively and varied discussion.

The remedy might be to form yet another Section of the Institution for those interested mainly in natural and applied science; and then the Installations Section could resume its former role of encouraging those engaged in the installation, operation, maintenance and application fields to come forward with greater confidence to talk "shop."

Chislehurst. A. N. D. KERR, A.M.I.E.E.

Fluorescent Lighting

IS a fluorescent lamp installation really so much cheaper to run than an equivalent tungsten one? The following details show that with cheap electricity the greater efficiency of the fluorescent lamp may be outweighed by its higher capital charges and greater cost of lamp renewals:—

	150 W Tungsten	80 W Fluorescent
Average lumen-output	1,970	1,920
Consumption	150 W	90 W
Life	1,000 hr.	2,000 hr.
Cost of lamp	3s. 5d.	£1 4s. 0d.
Approximate cost of "Glasteel" diffuser, including erection	£3	—
Approximate cost of fluorescent fitting, including erection	—	£10

Assuming that each lamp is burnt for 1,000 hr per annum, that the cost of energy is ½d. per kWh and that the capital charges

are 10 per cent (interest 5 per cent, depreciation 5 per cent) we have running costs per annum as follows :—

	150 W Tungsten	80 W Fluorescent
Cost of energy . .	6s. 3d.	3s. 9d.
Allow for lamp renewal .	3s. 5d.	12s. 0d.
Capital charges at 10 per cent	6s. 0d.	£1 0s. 0d.
Total cost . . .	15s. 8d.	£1 15s. 9d.

There will thus be an annual saving using tungsten lamps of £1 0s. 1d. per lamp. Even with the cost of electricity as high as 4d. per kWh there will be a saving of 2s. 7d. per lamp. If purchase tax on tungsten lamps is removed there will be a further saving of 8d.

Each installation must, of course, be judged on its own merits and the figures given above suitably amended, but they do show that costs must be carefully considered before fluorescent lamps are installed on the grounds of economy.

B. NISBET,
Graduate I.E.E.

*London, S.W.*20.

Illumination Values

WITH reference to Mr. H. G. Batson's letter in your issue of March 29th, I agree with him as to the importance of interior decoration as a factor in indirect illumination, as affecting both the colour and distribution of the light and also as having an important psychological effect according to whether it is monotonous or interesting to the eye.

I hardly think that lack of unidirectional effect can in itself have much influence in causing fatigue, though unsuitable colour and, still more, monotony of decoration undoubtedly can. Artists, architects and many others whose work depends on good seeing conditions usually prefer a north light because of the absence of pronounced unidirectional effect, such as sunlight, which is so trying to the eyes. On the other hand there will seldom be absolute equality of reflection from all sides owing to the variety of objects with different reflecting powers in most rooms. Any considerable reflecting area should be broken up by suitable decorations to provide lights and shades, as a large unvaried area can be very depressing and trying to the eye.

I further agree with Mr. Batson that various factors, such as the one he mentions and also malnutrition and nerve-strain, contribute to the lowering of the general standard of eyesight, but I think, and I am supported by several eminent ophthalmologists, that the biggest factor is the excessive amount and intensity of artificial lighting in recent years, especially in conjunction with the universal a.c. supply, which, even though not consciously noticed by the user, is hammering on the retina all the time.

G. V. DOWNER.

*London, W.C.*1.

Appliance Connections

AS an ordinary domestic user of electricity, I feel impelled to ask if the industry can do nothing to improve its methods of connecting up appliances. I am too often involved in minor repairs to appliances because something or other has "fused." Electricity is fine up to the point where it is switched on and, in general, the appliances whether these be for light or heat are well modelled and designed, but the connections between the switch and the heat or light it controls are weak links in the chain.

Take an ordinary lampholder: in a very short usage its life, in my experience, may be gone, especially if it is made of "plastic." It has become brittle and the very act of putting in a new lamp may cause the holder casing to break away like chocolate, or the ring which holds the shade has "seized" and cannot be removed without breaking the whole.

Then, look at an electric iron, or an electric fire. Breakdown rarely occurs at the wall-switch end, but at the appliance end. It happens because heat has travelled back through the connecting terminals and wires and has caused the insulation to perish. It seems so futile that cables and wires are so thoroughly insulated electrically with threads, tapes and coatings and yet cannot withstand heat. A modern electric iron is streamlined, balanced, grooved for steam, pilot lighted and is a relatively expensive article but when it does go wrong it is where the cable enters the casing or just inside.

When I think of the research and inventiveness behind the generation and distribution of the current and in the design of appliances, I wonder when we shall get something approaching perfection at the point of usage.

A. S. ANDERSON.

Welwyn Garden City.

Fluorescent Lamp Lecture

So many people had to be refused admission to the Electric Lamp Manufacturers' Association's forty-third Illumination Design Course at the Lighting Service Bureau on March 21st, when Mr. C. R. Bicknell lectured on "Fluorescent Lamps," that the lecture is being repeated on Monday, April 15th, at 7 p.m. The Bureau must be notified of proposed attendance by April 12th.

PERSONAL and SOCIAL

News of Men and Women of the Industry

AS announced last week, **Mr. H. Jack**, chief electrical engineer, **Mr. A. A. Pollock**, chief mechanical engineer, and **Mr. L. J. Davies**, head of the Research Laboratory, have become directors of the British Thomson-Houston Co., Ltd. Mr. H. Jack, B.Sc., M.I.E.E., who is an

Mr. H. Jack

Mr. A. A. Pollock

Mr. L. J. Davies

engineering graduate of Glasgow University, joined the company in 1908, most of his time since having been spent in the A.C. Engineering Department, of which he became head in 1922. He was appointed chief electrical engineer in 1945.

Mr. A. A. Pollock, B.Sc., graduated at the Royal College of Science, Dublin, and in 1902 joined the company's D.C. Engineering Department, of which he was appointed head in 1911. He developed the shop technique in commutator building, fabricated structures, and new methods of mechanical construction of large m.g. sets and other electrical machines, and rectifiers. He was responsible for the design, in 1919, of the then largest reversing rolling mill motor (25,000 H.P. peak). In 1923 he designed the propulsion machinery for the first Diesel-electric in this country, and in 1941-3 was responsible for the design and manufacturing technique of electric torpedoes. Mr. Pollock developed the "controlled current" system and some of its applications with the use of a three-winding exciter—a forerunner of the modern Amplidyne control. He was appointed chief mechanical engineer in 1945.

Mr. L. J. Davies, M.A., B.Sc., who now becomes director of research, gained an open exhibition in natural science at Jesus College, Oxford, and after graduation, carried out research work on low pressure electrical discharges. He joined the B.T.H. Research Laboratory, on its formation in 1924, under its first chief, Mr. R. C. Clinker, working, first, on radio valves. He became head of the Vacuum Physics Section and was appointed lamp research engineer in 1942 and head of the Research Laboratory in 1945. He has been concerned for many years with the development of the discharge lamp. He has served on the Council of the Illuminating Engineering Society, and is a member of the E.R.A. Council. He has published a number of technical papers, and in 1942 was awarded (as a joint author) the Crompton Premium of the I.E.E. for a paper on "Fluorescent Lamps."

The executive side of the Ministry of Works has been reorganized. Under the new arrangements Mr. C. J. Mole, C.V.O., O.B.E., F.R.I.B.A., becomes Director-General of Works; Mr. W. A. Rutter, O.B.E., F.R.I.B.A., chief architect; Mr. C. A. Morrison, O.B.E., F.S.I., chief surveyor (quantities and costs); Mr. A. G. Ramsey, O.B.E., M.Sc., M.Inst.C.E., M.I.E.E., chief mechanical and electrical engineer; and Mr. S. R. Cauthery, O.B.E., A.M.I.E.E., chief production officer.

At the luncheon of the Radio Industries Club at the Connaught Rooms, London, on March 26th, **Professor H. S. W. Massey**, F.R.S., spoke on "Atomic Energy" and its probable uses for other purposes than military, including radio. Professor Massey was one of the

Left to right: Capt. H. de A. Donisthorpe, chairman of the Club, Prof. H. S. W. Massey, F.R.S., Mr. A. J. Dew (vice-chairman) and Vice-Admiral J. W. S. Dorling, R.N. (ret.), director, Radio Industry Council

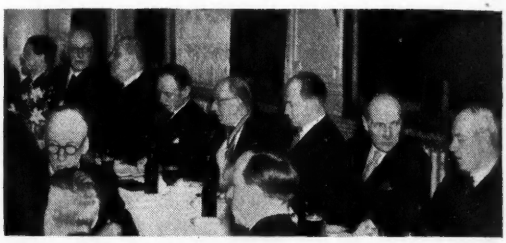
British team of scientists who visited America. We reproduce a photograph taken on the occasion.

The St. Helens Corporation Electricity Department has recently made a number of appointments. **Mr. A. R. Cooper**, A.M.C.T., recently electrical sub-lieutenant, R.N.V.R., and previously employed with the Stalybridge, Hyde, Mossley & Dukinfield Transport and Electricity Board, has been appointed junior mains assistant. **Mr. F. Rowell**, Grad.I.E.E., formerly employed in the Switchgear Department of the Metropolitan-Vickers Electrical Co., has been appointed junior engineer in the power station. **Mr. D. G. Chalmers**, B.Sc.,

Grad.I.E.E., lately employed with Rolls Royce, Ltd., at their Glasgow factory, has been appointed development assistant, Consumers' Department. **Mr. R. P. Astill,** A.M.I.E.E., formerly with the Leicester Corporation Electricity Department is awaiting his release from Admiralty work in order to take up duties as mains assistant.

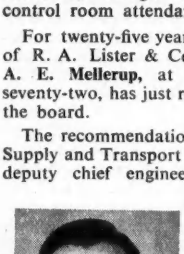
Hackney Borough Council Establishment Committee has recommended the appointment of **Mr. J. W. Crighton,** at present substation charge engineer, as control room attendant.

For twenty-five years a director of R. A. Lister & Co., Ltd., **Mr. A. E. Mellerup,** at the age of seventy-two, has just resigned from the board.



At the Batti-Wallahs' first post-war luncheon. Left front: Mr. W. N. C. Clinch. Left to right: Dr. L. G. Brazier, Sir Thomas Purves, Mr. J. McCaffery, Mr. W. E. Warrilow, Mr. P. V. Hunter, Mr. F. Waine, Mr. H. Nimmo and Sir Geoffrey Clarke

The recommendation of the Ipswich Electric Supply and Transport Committee to appoint, as deputy chief engineer, **Mr. R. A. Jackson,** A.M.I.E.E., distribution superintendent of the Erith electricity undertaking, has been confirmed by the Ipswich Council. The appointment was referred to in our issue of March 1st. We reproduce a photograph of Mr. Jackson, who previously occupied positions in Croydon Electricity Department, before going to Erith.



Mr. R. A. Jackson

The Minister of Supply has agreed to release **Mr. S. F. Steward** from his post as Director-General of Machine Tools to return to industry as from March 31st. Before joining the Ministry, Mr. Steward was with Bull Motors.

The Minister has also agreed to the release of **Mr. K. G. Lampson,** Deputy Iron and Steel Controller, as from March 31st, in order to return to his company. Mr. Lampson will continue to act in an advisory capacity to the Controller.

Mr. R. D. Burn has been released from his position as Director of Non-Ferrous Metals and is succeeded by **Mr. A. G. Charles.**

Nearly a hundred members of the Batti-Wallahs' Society and their guests were present at the first post-war reunion and luncheon held at the Connaught Rooms, London, on Thursday last week. Among them were three of the original members of the Society when it was founded in 1906—Mr. J. F. Avila (a past-president), Mr. M. R. Gardner and Mr. E. C. Stanford. Mr. J. McCaffery, past-president, introduced the new president, Mr. P. V. Hunter, who in turn welcomed the principal guest of the day, Mr. W. E. Warrilow, himself a member of the Society for twenty-six years. Speaking of his fifty-two years in the electrical industry, Mr. Warrilow gave some interesting and amusing reminiscences of his early experiences in the electricity supply industry, in technical journalism and in advertising. Mr. Warrilow's health was proposed by Mr. F. Pooley, a past-president, who congratulated Mr. H. Whitgift, the hon. secretary, on his happy thought in choosing as speaker someone who had been connected with the Society for so long.

It is recommended that **Mr. R. H. Harral,** borough electrical engineer of Blackburn, shall be paid £3,250 for his services in connection with extensions of the Corporation's power station and that the town clerk and borough treasurer shall receive £500 each. It is stated that consultants' fees amounting to £51,500 have been saved to the Corporation. Last year similar payments were made in respect of an earlier extension.

Mr. A. E. Page has been appointed sales manager, Osram Lamp Department. Mr. Page joined the General Electric Co., Ltd., in 1915 and after several years at head office he spent a number of years travelling in London and the provinces as a lamp specialist. In 1926 he rejoined the inside staff and was appointed assistant manager of the Department in 1930.

Mr. A. E. Page

The Recreation Club of the Bradford Corporation Electricity Department, of which Mr. T. H. Carr, the electrical engineer and manager, is president, recently broke new ground with the production of the pantomime " Cinderella." Skits on the everyday work of an electricity undertaking were thoroughly enjoyed by the crowded houses, " The Hole in the Road," a burlesque of a mains jointing gang at work, and " Selling a Kettle," showroom routine played in the best pantomime tradition, being two of the

"high-spots." The script was written by Messrs. Hutchison and Lynch, two members of the Department's staff, and the show was produced by Mr. A. Haselhurst, the commercial manager. A further three performances are to be given in aid of a local charitable society.

Mr. J. S. Pickles, vice-president, has been nominated to succeed Alderman Sir William Walker as president of the Incorporated Municipal Electrical Association, and **Mr. J. Eccles** (Liverpool) has been nominated vice-president.

The Local Distribution Committee of the London and Home Counties J.E.A. has approved the following appointments:—Areas officer (consumers), Mr. C. W. Hughes, B.Sc., M.I.E.E. (J.E.A.); area officer (mains), Mr. W. E. Jones, M.I.E.E. (engineer and manager, Basingstoke Electricity Department); district officer, Sutton, Mr. C. W. Emanuel, A.M.I.E.E. (engineer and manager, Workington Electricity Department); district officer, Surbiton, Mr. J. D. Parkinson, A.M.I.E.E. (UNRRA, previously Ayrshire Electricity Board); district officer, Twickenham, Mr. W. H. A. Bellis, B.Eng., A.M.I.E.E. (Westmorland and District Electricity Supply Co.); purchasing officer, Mr. C. N. Lockwood (J.E.A.)

Mr. C. D. Taite

The following have been elected or appointed as members of the London J.E.A.:—Representing county councils: Mr. S. E. Jackson (Surrey C.C.); Railway Companies' Association: Mr. P. Croom-Johnson; extra-London local authority undertakings: Alderman W. A. V. Bryan (Ilford) and Mr. F. N. Rendell-Baker, M.I.E.E. (Croydon).

Capt. W. H. Leech has been appointed submarine cables superintendent of the Post Office Engineering Department in succession to **Capt. E. W. Firmin,** who retires at the end of the month. **Capt. Leech** will have charge of the Post Office fleet of cable ships.

Mr. Alfred Clark is to retire from the chairmanship of the board of Electric & Musical Industries, Ltd., but will continue as a director and also to occupy the position of president of the company. The deputy chairman, **Sir Alexander Aikman,** C.I.E., who has been a member of the Board for a number of years and who temporarily filled the position of managing director between the date of retirement of Sir Robert McLean and the arrival of Sir Ernest Fisk, has been elected chairman.

Mr. H. W. Bowen, O.B.E., who joined the Gramophone Co., Ltd., in 1940 as production manager, has been appointed managing director of E.M.I. Factories, Ltd., the new company which is taking over the manufacturing plant of the E.M.I. group.

At the annual general meeting of the Lancashire Electric Light & Power Co., Ltd., the chairman, Sir Joseph Nall, D.S.O., D.L., announced the retirement at the end of March of **Mr. C. D. Taite,** M.I.E.E., managing director of the Lancashire Electric Power Co. Mr. Taite joined the company in 1907 as engineer and manager and built up the business by securing Special Orders for the many areas which it now serves and negotiating agreements to supply other local authorities in bulk. He has rendered valuable service to the industry in many important offices; he has been chairman of the National Consultative Committee, C.E.B.; chairman of the E.D.A. Council; member of the N.J.I.C. and N.J.B. for the Electricity Supply Industry; president of the Incorporated Association of Electric Power Companies; and member of the Lancashire Industrial Development Council.

Mr. M. H. Adams

Mr. S. M. Rix

Mr. M. H. Adams, M.I.Mech.E., who has been appointed chief engineer and manager, has held the position of engineer of the Generation Department of the company for a number of years and is chairman of the Boiler Availability Committee. Mr. Adams has also been appointed to the board.

The retirement of **Mr. J. Purrett,** assistant engineer and manager, is also announced. Mr. Purrett joined the company in 1907 at the same time as Mr. Taite, with whom he has closely collaborated in the expansion and development of the undertaking. **Mr. S. M. Rix,** A.S.A.A., F.C.I.S., in addition to his duties as secretary of the company, has been appointed assistant manager with special responsibility for all administrative and commercial departments.

Mr. F. R. Haigh, senior lecturer in electrical engineering at Wigan Mining and Technical College, has been appointed borough electrical engineer at Farnworth in succession to **Mr. A. J. Hutchinson,** who has retired after forty years' service. Mr. Haigh gained the B.Sc.(Hons.) degree in electrical engineering at Leeds University. From 1938 to 1943 he was a member of the staff of the Yorkshire Electric Power Company.

Dr. Bernard Hague has been appointed to the James Watt Chair of Electrical Engineering at the University of Glasgow, which is to be vacated by **Dr. G. W. O. Howe** later in the year. Dr. Hague, who was born at Barnsley in 1893, was educated at the Grammar School, Eccles, and the Central School, Rochdale, and received practical training with Carter Bros., Rochdale, and Ferranti, Ltd. Proceeding to the Department of Electrical Engineering of the City and Guilds College in 1913, he graduated B.Sc. (London) with first-class honours in engineering and also received the diploma of the Imperial College for advanced study and research. He proceeded to the London M.Sc. degree in 1919 and received his doctorate in 1927; he took the Ph.D. (Glasgow) degree in 1926.

In 1916 Dr. Hague became a technical assistant in the Physics Research Department of the Royal Aircraft Establishment but relinquished his position in 1920 to become a lecturer at the City and Guilds College and while there lectured in mathematics at the Battersea Polytechnic. He went to the University of Glasgow in 1923 as lecturer in electrical engineering and has occupied various positions there since that date. In 1929-30 he was given leave of absence to act as visiting professor in the Polytechnic Institute of Brooklyn, New York. Dr. Hague has acted as examiner in a number of directions and is a member of the Institution of Electrical Engineers and of the American Institute of Electrical Engineers. He has published four books: on a.c. bridge methods, electromagnetic problems in electrical engineering, instrument transformers and vector analysis and is producing further works on locus diagrams and transient phenomena. In addition he has published twenty-one papers on a variety of electrical and allied subjects. Apart from his professional work Dr. Hague is a keen musician and has been very active in Glasgow musical circles.

Mr. A. C. V. Bristol has resigned the position of sales manager of the Maxlume Department of Veritys, Ltd., to take over the export management of T. D. Bailey & Son, Ltd., 17/19, Bury Street, E.C.3, on May 1st next, when he will leave for a tour of Scandinavia.

Mr. H. S. Dawson, consumers' engineer in Middlesbrough Corporation Electricity Department, retired at the end of March. He has been succeeded by his assistant, **Mr. W. E. Dalby.**

Mr. J. R. M. Duncan, chief chemist of the Craigpark Electric Cable Co., Ltd., has been appointed technical manager.

Mr. Jack Wilson has joined the Sales Department of Johnson & Phillips, Ltd., and is attached to their Birmingham branch, operating in Nottinghamshire and part of Derbyshire. Mr. Wilson was in the Sherwood Foresters before the war, and was taken prisoner in Norway in 1940. His address is " Bank Villa," Pleasley, nr. Mansfield.

Mr. E. J. A. LeRoy, for many years chief showroom assistant to the Brighton Corporation Electricity Department, has been appointed sales engineer to H. & E. Lintott, Ltd., Horsham, who are shortly opening new electrical showrooms.

Obituary

Mr. C. H. Jones.—We regret to record the death in his seventieth year of Mr. C. H. Jones, F.C.I.S., who until his retirement in 1941, was the secretary of Edmundsons Electricity Corporation, Ltd. Mr. Jones joined Edmundsons at the end of the last century and was appointed its secretary in the early 1900's. He was also secretary at one time or another of 28, and director of 56 of the subsidiary and associated companies within the Edmundsons Group.

Mr. W. D. Watson.—The funeral took place on March 21st of Mr. W. D. Watson, inventor of one of the first electricity prepayment meters. He was managing director of the Rochdale Electric Co. since its formation in 1896 to manufacture the slot meter, and he was responsible for many of the largest electrical installations in the Rochdale district. Mr. Watson was eighty-one.

Ex-Alderman Robert Roberts, who died on March 27th, at the age of eight-seven, was chairman of Lancaster Electricity Committee for many years.

Transformer Oil

General Discussion by Producers and Users

IN order to give representatives of the petroleum and electrical industries an opportunity to discuss matters of common interest relative to transformer oil, a meeting is to be held on April 9th at the Institution of Electrical Engineers in London, commencing at 3 p.m. with a second session at 6 p.m., after a tea interval.

The chairman will be Mr. E. A. Evans (C. C. Wakefield & Co., Ltd.) who is vice-president of the Institute of Petroleum and will himself read one of the nine papers to be submitted. He will deal with oxidation and anti-oxidation, while Mr. A. A. Pollitt (Metropolitan-Vickers Electrical Co., Ltd.) will concern himself with oxidation tests, and Mr. P. W. L. Gossling (W. B. Dick & Co., Ltd.) with the effect of water temperature on the sludge test; Messrs. P. W. L. Gossling and A. C. Michie will survey the E.R.A.'s work on transformer oil, Mr. J. Wood-Mallock (Lobitos Oilfields, Ltd.) will describe developments in refining, Messrs. P. George and A. Robertson (Cambridge University) will contribute two papers on oxidation reactions in liquid hydrocarbons and how they are influenced by structure, and Mr. C. H. Barton (Asiatic Petroleum Co., Ltd.) will deal with the sludge test for transformer oil.

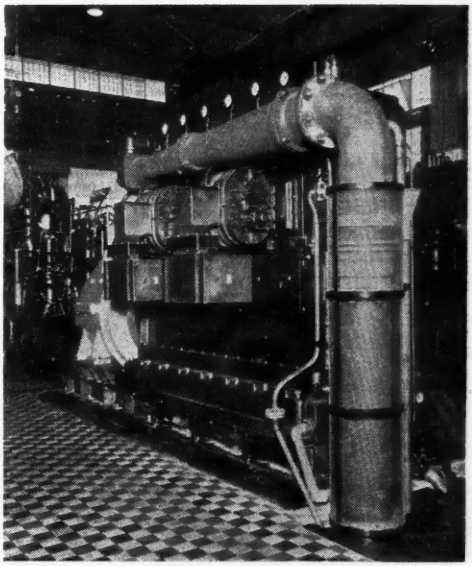
College Power Station

Extensions at Loughborough

FOR meeting its technical and other electrical requirements, Loughborough College requires about 750,000 kWh per annum for which 1 to 1½ tons of fuel are consumed each working day (5½ per week). The daily load factor varies from 58 to 86 per cent, the normal peak load being 1,475 A at 235 V in winter (with a maximum of 2,150 A on Saturday mornings) and 800 A in summer. This output is all obtained from the College Diesel power station, the operation of which is part of the engineering students' normal training. The plant is kept constantly up to date, a system which enables the students to trace the evolution of oil-engine design over the past thirty-five years.

The latest addition—in December last—is a six-cylinder two-stroke 540-B.H.P. 600-r.p.m. Petter "Superscavenge" engine direct coupled to a Brush d.c. generator. Fuel consumption was specified not to exceed 0·37 lb per B.H.P.-hr in conjunction with an exhaust temperature of 560 deg F. The new set which replaces a six-cylinder 500-B.H.P. Vulcan engine, originally an auxiliary in a German submarine, brings the total installed capacity to 3,230 B.H.P. The four other units in the station consist of a six-cylinder four-stroke M.A.N. 1,850-B.H.P. 325-r.p.m. U-boat engine dating from 1917, a six-cylinder four-stroke Mirrlees 330-B.H.P. 300-r.p.m. air-injection engine of pre-1914 design, a two-cylinder two-stroke Vickers-Petter set built in 1925 and a five-cylinder Ruston & Hornsby of 330-B.H.P. at 335-r.p.m. The Mirrlees engine is the only one driving an alternator and so runs most of the time, generally on special power loads, such as a.c. welding and for supplying fluorescent lighting in the metrological laboratory. The alternator is a Brush three-phase 400-V 50-cycle machine of 248 kW with overhung exciter. Most of its output of 1,170 kWh each working day is converted to d.c. by means of a tap-started 190-kW rotary convertor fed through a 200-kVA oil-cooled transformer, both of Brush make. Voltage is controlled by a non-automatic compounding static regulator which consists of a current transformer, the primary of which carries the alternator output current and the secondary supplies through a Westinghouse metal rectifier a special winding on the exciter field. In parallel with the secondary and rectifier are a rheostat controlling compounding from zero to maximum and barretters (constant-current metal lamps in hydrogen) that influence the shape of the characteristic, especially at low loads.

The Ruston engine drives a Lancashire Dynamo Co.'s 225-kW d.c. generator. The exhaust for this engine is to be coupled to a 1,000 lb per hr Cochran boiler, now connected only to the exhaust of the Mirrlees unit to heat the engineering block of buildings. In addition to the many electrical and mechanical features of the station there is a 130-cell battery for providing current during non-



View of the new Petter "Superscavenge" engine showing the Roots blower and exhaust manifold; in the left background is the Mirrlees engine

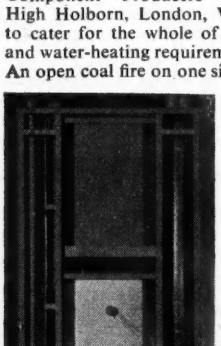
working hours. The fourteen-panel switchboard of planished steel on angle iron, which has the operating position of switches indicated by lamps, was built and wired by students; most of the switchgear was taken from German submarines of the 1914–18 war.

The conception of the station as a whole is due to Dr. Herbert Schofield, the principal. Its operation is under Mr. F. A. Stapleton (head of the works department), Mr. G. Smith (chief engineer) and Mr. W. N. Hall (power-house superintendent).

Coal-Electric House Unit

Provision of Complete Heating and Cooking Services

SOLID fuel and electricity can be utilized either simultaneously or separately in an all-purpose service unit which the Building Component Producers' Association, 31-33, High Holborn, London, W.C.1, is introducing to cater for the whole of the heating, cooking and water-heating requirements of a small house. An open coal fire on one side of the unit, besides providing heating for the hot-water installation, also incorporates the oven. Fitted in the back of this oven is a 1,750-W mineral-insulated tubular element with a 2-kW grill element at the top. The electric heating can be used either by itself or to boost the heat from the coal fire.



All-purpose service unit

Two hinged pressed-steel covers forming an insulated cavity above the fuel-heated hotplates over the oven are fitted with 1,450-W "Red Ring" boiling plates controlled by "Simmerstats" and with removable aluminium reflectors. Cut-out switches automatically switch off the elements if the covers are raised. A 2-kW thermostatically controlled immersion heater in the hot-water tank can be used alone or as a booster.

Air admitted from outside the building is warmed in a duct above the fire and carried to the bedrooms. This convected air can be controlled at the ports in these rooms, or, in warm weather can be by-passed into the ventilating duct from the kitchen. The cold tank is placed below the first floor ceiling to avoid freezing.

Mounted to the right of the oven is a flush-fitting vitreous enamelled "Autolec" control panel incorporating all the switches for the oven. hot-plates, water heater, kettle/iron socket and a light over the hob. Also included in the panel is a compact fuse assembly (accessible through a hinged door) complete with insulated screwdriver, the handle of which contains the three sizes of fuse wire required. The "tree" wiring for the rest of the house is carried within the framework of the unit and the controlling fuses are also located in the "Autolec" panel.

G. W. B. Electric Furnaces, Ltd., are responsible for the electrical part of the installation. Reference to the unit, the cost of which complete is given as £150, is contained in the Report of the Fuel and Power Advisory Council on Domestic Fuel Policy reviewed on another page.

Highland Agriculture

Electrification Survey

A TECHNICAL Report (Ref. W/T9) has been issued by the British Electrical and Allied Industries Research Association on "The Electrification of Highland Agriculture" (3s. net). This Report, which was compiled by Mr. C. A. Cameron Brown, is based on a short survey of the areas covered by the North of Scotland Hydro-Electric Board's scheme and is, in some respects, a sequel to the author's previous study, issued as Ref. W/T2, "A Critical Study of the Application of Electricity to Agriculture and Horticulture."

Particular attention has been paid to crop drying in its various forms, which is an outstanding need in the Highlands, to improving the standard of milk production, and to simplifying the working of the farm buildings. The needs of the crofter have been considered and, in view of the impracticability of complete mechanization of each croft, the mechanism of communal operation of group machinery has been suggested. The possibility of intensive poultry and horticultural production for the more advanced crofter has also been examined. Through lack of knowledge of possible market conditions and economic position generally, no attempt has been made to build an economic balance sheet, the author being content to indicate, in each case, the possible mechanism of production.

COMMERCE and INDUSTRY

Overseas Trade Arrangements. Higher Pay for Electricians.

Export Promotion Department

AS a result of the Department of Overseas Trade (Dissolution) Order, 1946, which was made on March 20th, the D.O.T. ceases to exist as a separate department. On April 1st its functions were taken over by a newly formed Export Promotion Department of the Board of Trade, to which the staff of the D.O.T. is being transferred. Mr. H. A. Marquand, the present Secretary of the D.O.T. becomes an additional Parliamentary Secretary to the Board of Trade with the title of " Secretary for Overseas Trade."

It is intended that, as soon as circumstances permit, the Export Promotion Department shall be housed with the rest of the Board of Trade headquarters. Meanwhile it will remain at 35, Old Queen Street, London, S.W.1 (telephone: Victoria 9040).

As was explained by the Prime Minister in December, the object of the new arrangements is to improve the services which the Government can render to overseas trade. The new Department will continue to afford all the facilities for exporters previously available in the Department of Overseas Trade.

Raw Materials Control

The transfer of the Raw Materials Department from the Ministry of Supply to the Board of Trade, announced some time ago, took effect on April 1st. The address of the Department is now I.C. House, Millbank, London, S.W.1 (tel.: Franklin 2211). Branches of the Department situated outside Shell-Mex House retain their present addresses, but under the Board of Trade. Responsibility for salvage and certain semi-manufactured and manufactured articles is being transferred at the same time.

The following materials, hitherto dealt with by the Raw Materials Department, will remain with the Ministry of Supply:—Agates, antimony, arsenic metal, cadmium, carbon and graphite electrodes for furnaces, chrome, cobalt, copper, diamond dies and tools, dolomite, fluorspar, lead, quartz crystals, tantalite, tin, foundry bonding materials, grinding wheels (including abrasives), iron and steel and ferro alloys, magnesite, molybdenum, monazite sand, nickel, refractories, tungsten, vanadium and zinc. Any relevant licences issued before April 1st will remain in force.

By an Order in Council which became effective on April 1st, the Board of Trade takes over the trading functions of the Ministry of Supply in respect of any transferred materials, together with any relevant contracts entered into by the Raw Materials Department on behalf of the Ministry, and the ownership of the stocks held by the Department passes to the Board.

Defence Medal

With regard to the issue of the Defence Medal, the Electricity Commissioners state that it has been decided that local authorities shall be responsible for the verification of claims in respect of qualifying service performed at premises occupied by public utility undertakings and for the issue of the medal ribbon in approved cases. Claims should not be referred to the Commissioners.

Royal Visit to Battersea

Queen Mary and Princess Elizabeth paid a visit on Thursday last week to Battersea power station and to Eccleston Place substation. They were shown the whole process of generation, transmission and distribution right from the coal jetty on the Thames, through the boiler house, turbine room and main control room to the actual circuit-breaker controlling the supply to Buckingham Palace.

The tour included an inspection of the power station's all-electric canteen, and at Eccleston Place, where they were shown the switchgear and machinery for stepping down the pressure and controlling distribution, they were presented by the C.L.E. with examples of the latest type of heat-controlled electric irons.

Queen Mary and Princess Elizabeth in the control room at Battersea power station. Explaining the apparatus to them is Sir Leonard Pearce, engineer-in-chief of the London Power Company

Among those who accompanied the royal visitors on their tour were Lord Lytton, chairman of the London Power Co. and Central

London Electricity, Ltd.; Sir Leonard Pearce, engineer-in-chief to the Power Co.; Mr. Clarence Parker, managing director, C.L.E.; Mr. J. W. Leach, chief engineer-in-chief, C.L.E.; Miss Caroline Haslett, director of the Electrical Association for Women; Mrs. Shinwell, wife of the Minister of Fuel and Power; Mr. L. H. Welsh, deputy engineer, C.L.E.; Mr. R. R. Martindale, chief operations engineer, London Power Co.; and Mr. H. J. Taylor, station superintendent.

Electricians' Wage Increase

The National Joint Industrial Council for the Electrical Contracting Industry has agreed to the following rates for journeymen electricians: Grade "A" area (London), 2s. 9d. per hour; Grade "B" areas, 2s. 6d. per hour; and Grade "C" areas, 2s. 5½d. per hour, pending further discussions on the long-term wage policy of the industry. The new rates operate from the third pay-day in April until the second pay-day in January, 1947. They do not apply to Scotland.

Cable Makers' Holidays

The Joint Industrial Council for the Electrical Cable Making Industry has decided to institute payment for statutory holidays, commencing with the coming Easter holidays. Six days a year are involved, varying as between Scotland and England and Wales. Payment will be made at the appropriate standard day time rate, including cost-of-living bonus, for 8½ hours for each full day and 4½ hours for a Saturday. Shift and night allowances will not be included in holiday payments.

Export of Surplus Machine Tools

The increasing quantities of Government surplus machine tools becoming available for the re-equipment of British industry has enabled the Ministry of Supply and Aircraft Production to modify the conditions for export. The period of four months during which machines are on offer to British industrialists through the Disposal Centres is reduced to two months and purchasers for export may acquire the machines at the same favourable prices as users in the United Kingdom.

Census of Production

The Government has approved the recommendations of the Committee under the chairmanship of Sir George Nelson which reported last year on the additional information which should be collected at future Censuses of Production. It has been decided that the next full census shall be taken in 1948 based on 1947 production but that a partial census covering a limited number of industries shall be taken this year; among the industries involved in this partial census will be mechanical and electrical engineering.

Essential Work Order Notice

The extent of the withdrawal of the iron and steel industry from the scope of the Essential Work Order on May 15th has been widened to cover the following additional sections of the industry: Iron founding, iron and steel tubes, pipes and fittings, and the steel sheets and tinplate section. This means that the whole of the iron and steel industry will be withdrawn from the scope of the Essential Work Orders on May 15th.

Notices will be issued to the individual undertakings concerned, giving them at least one month's notice. Until individual de-scheduling takes effect, the provisions of the Essential Work Orders remain in force for all employers and workers.

Hammersmith Reclassification

The Hammersmith Borough Council Electricity Committee has decided, following an application from the technical staff of the Electricity Department, that as from July 1st next the classification of the undertaking shall be advanced from Class G to Class H in accordance with the provisions of the N.J.B. Schedule.

Coventry Gauge and Tool Exhibition

Many home and foreign visitors have attended an exhibition arranged by the Coventry Gauge & Tool Co., Ltd., at its works. New machines, instruments and processes are being demonstrated to show the results of wartime experience

Lieut.-General Wrisberg, Director-General of Munition Production, and Captain le Mesurier, Deputy Director of Naval Ordnance, with Mr. H. H. Harley, C.B.E., managing director of the Coventry Gauge & Tool Co., at the company's exhibition

in the production of precision apparatus. During the war the company was engaged entirely in producing such equipment as naval firing predictors, aircraft components, etc. It is intended to keep the exhibition running for several weeks.

Apparatus Change-over Dispute

In 1938 the Barrow-in-Furness Town Council approved a resolution which laid down the principles to be adopted in the matter of compensation to consumers adversely affected by a change-over from D.C. to A.C., but apparently details of these principles were not made public. The change-over had to be suspended on account of the conditions created by the war. In September last a Mr. J. Robertson installed a d.c. mains-operated radio set and shortly

afterwards was notified of the Council's intention to change his supply. He was later informed that the radio set could not be considered as coming within the scope of compensation as he had not notified the Council of its installation. Mr. Robertson thereupon brought the matter to the attention of the Electricity Commissioners who have informed him that any conditions requiring consumers to obtain the undertaking's approval to installation is contrary to law and cannot be enforced.

Shortage of Accessories

Following representations by electricity supply authorities throughout the country the Council of the British Electrical Development Association has sent copies of the following resolution to the President of the Board of Trade and the Ministries of Health, Works, and Fuel and Power: "That this Association is very concerned at the inability of its members to carry out their business due to the acute shortage of satisfactory electrical accessories, particularly 15-A, 2-pin switch plugs, 15-A, 3-pin switch plugs, switches, ceiling roses, lampholders, fuse boards, switch-fuses and lamps; and also desires to direct attention to the availability of large quantities of inferior and often unsafe accessories for the manufacture of which material and labour appear to be obtainable."

Production of Appliances

According to the "Monthly Digest of Statistics" for March, the average monthly production of electric fires in the last quarter of 1945 jumped to 115,000 from the figure of 37,700 for the preceding quarter. This was higher than the 1935 rate, 100,000, which however is said to be "based on rather uncertain data." The monthly production of electric irons at 155,000 was about double that of the previous quarter. Vacuum cleaner production is given as 17,300 (against 10,800) and that of electric kettles as 21,000 (13,200). In January 37,000 radio sets were produced, against a monthly average of 22,700 in the last quarter of 1945.

Television Engineers' Training School

All vacancies for the Pye Television Training School have been booked up to May 4th. Dealers wishing to apply for vacancies in the fortnightly course, commencing on May 6th, and for subsequent fortnightly courses, should write to Mr. Greenep, service manager, Pye, Ltd., Radio Works, Cambridge. For engineers from country districts who wish to stay in London for the training course owing to travelling difficulties, there are still vacancies for the next whole week course, starting May 20th.

Reports on German Industry

Further reports now available of parties which have visited Germany under the auspices of the Intelligence Objectives Sub-Committees include the following:—C 105 XXV–17, "The Electrochemical Industry, Burghausen Area" (3s. 6d.); C 105 XXVIII–38, "Selenium Rectifiers S.A.F., Nürnberg. Institut für Anorganische und Physikalische Chemie, Darmstadt" (1s. 6d.); C 105 XXIX–47, "Cyclotron Investigation" (2s. 0d.); C 105 XXX–57, "Radio Telemetering Receiver Selector developed at the Technische Hochschule, Darmstadt" (1s. 0d.); C 105 XXXII–81, "The Manufacture of Hard Rubber Parts for Storage Batteries" (2s. 6d.); B 105–26, "Copper Smelting and Refining, etc., at Norddeutsche Affinerie, Hamburg" (2s. 0d.); B 105–36, "Magnetic Materials and Beryllium" (2s. 6d.); B 105–179, "German Cable Industry" (12s. 6d.); B.I.O.S. 129, "German Electrical Utility Practice. Switching Substations and Power Plants" (1s.); B.I.O.S. 264, "German Brass and Copper Wire Industry" (2s.); C.I.O.S. XXX–36, "Physikalisch-Technische Reichsanstalt: Radar. Magnetrons developed and their use" (4s.); C.I.O.S. XXXI–9, "Robert Bosch G.m.b.H., Stuttgart: Aircraft Electrical Equipment" (8s.).

A few copies of these reports are available from the Stationery Office.

Modern Homes Exhibition

Probably the item of greatest electrical interest at the Modern Homes Exhibition now being held at Dorland Hall, Regent Street, London, is one which is only partly electrical and which is featured in a model kitchen sponsored by the Women's Advisory Committee on Solid Fuel. Styled the "House Engine," this ingenious contrivance (further details of which appear on another page) utilizes both solid fuel and electricity to provide the whole of the heating, cooking and water heating requirements of a house. The latest all-electric dual-purpose kitchen shown by the British Electrical Development Association has its main section devoted to food preparation and laundrywork, with a separate "bay" for use as a dining-room, sewing-room, etc. A "What's Wrong With It" kitchen is a novelty intended to illustrate common mistakes in kitchen planning, and visitors are given an opportunity in a competition to see how their ideas of good design of everyday household articles agree with those of experts. In a "Make Do and Mend" section can be seen how to make a standard lamp out of an old broom-stick and some rope. An arresting feature of the well of the hall is a "Bouquet of Light," demonstrating various effects obtainable with daylight and warm white fluorescent, ultra-violet and incandescent lighting.

Plea for More Electrical Porcelain

Visiting Stoke-on-Trent last week to make a personal appeal to workers at two electrical porcelain factories for increased output to meet housing needs, Mr. W. Leonard, Parliamentary Secretary to the Ministry of Supply, said that 5½ million electrical components a month were wanted for housing and only 3½ million a month were being produced. In a year the demand would be for 7½ million a month and in two years and thereafter for many years it would be 8½ million. If these supplies were not forthcoming the housing programme would be endangered.

Electric Vehicle Manufacture

Cleco Electric Industries, Ltd., are now in production with electric vehicles of their latest designs, incorporating such features as pedal acceleration, retractable battery mechanism, quick-make-quick-break double-pole mechanical

contactor cum mercury switch controller to obviate sticking contacts, short prop-shaft to avoid loss of balance through abuse in driving, etc. The company is also producing a limited, yet increasing, quantity of all metal bodies of standard unit design at prices little in excess of pre-war figures. A factory at Foundry Square, Leicester, shortly to be completed, will permit increased production of the company's full range of industrial electric works trucks, electric cars and vans, battery chargers, arc welders and ancillary apparatus.

Festoon Lamp Caps

Standard dimensions for low voltage (not exceeding 50 V) festoon lamp caps of two sizes (S.7 and S.85) are specified in B.S.1298, copies of which are obtainable for 1s. each from the British Standards Institution, 28, Victoria Street, London, S.W.1.

Electrical Machinery Traders

The first annual general meeting of the Association of Electrical Machinery Traders was held in London last week, Mr. W. E. Lawton (Industrial Electrical Co., Ltd.), chairman, presiding. In his report Mr. Lawton referred to the origin of the Association, the need for getting together and convincing the Government Department concerned that the proper channel for the disposal of surplus industrial electrical equipment was through traders of the calibre of the members of the Association.

Referring to relations with manufacturers' and contractors' organizations, Mr. Lawton stated that the Association desired to proceed on the basis of mutual goodwill and co-operation but went on to say that " any attempt to play down the functions of A.E.M.T. on the ground that there was no need for such an organization would be dealt with ruthlessly." He asked where traders found support and co-operation from the manufacturers of electrical machinery and where were the applicable discounts. The latter position was one which the Association was attempting to rectify.

It was proposed to make obligatory upon all members the standard conditions of trading published by the Association; it was considered that this would add to the status and integrity of the trader. An advertising scheme on behalf of members was about to be undertaken and it was strongly recommended that members should work to the specified standards.

The meeting adopted the proposal relating to standard conditions of training and approved the advertising scheme. Mr. Lawton was re-elected chairman with Mr. T. A. Atkinson (Dynamo & Motor Repairs, Ltd.) as vice-chairman and Mr. H. W. Cole (Milo Engineering Works) as treasurer.

Trade Publications

G.W.B. Electric Furnaces, Ltd., Dibdale Works, Dudley, Worcs.—Illustrated brochure on standard and special furnaces of many kinds for up to 1,150 deg C with air circulation at high velocity for the medium temperature types; all are automatically controlled.

Partridge, Wilson & Co., Ltd., Evington Valley Road, Leicester.—Illustrated and priced leaflet dealing with model " H " battery charger employing a "Drimet" selenium rectifier primarily designed for home use with car and radio batteries.

Rapid Magnetting Machine Co., Ltd., Lombard Street, Birmingham, 12.—Illustrated pamphlet describing the " Purex " electro-magnetic seed separator and moist or dry powder mixer.

Quasi-Arc Co., Ltd., Bilston, Staffs.—Illustrated leaflet (TC. 641) descriptive of type EH. 10 " Simpen " electrode holder for welding.

Applicants for copies of these publications should write on their firms' business notepaper.

Trade Announcements

Having some years ago acquired the business of Dewrance & Co., Ltd., Babcock & Wilcox, Ltd., have now transferred the whole of the Babcock valve business and the manufacturing capacity of their Dumbarton valve works to that company. Dewrance & Co., Ltd., will continue to operate as a separate organisation, and will maintain the manufacture, supply and service of certain designs of Babcock valves.

Kirolite (Sales), Ltd., of Bournemouth, announce the opening of a London showroom at 15, Bury Street, London, E.C.3.

The telephone number of Straight-Lite Reflectors, Ltd., has been changed to Canonbury 5675.

Creed & Co., Ltd., have transferred their Treforest works from E.4 to G.12 factory.

The Standing Committee of A.E.M.T. at the first annual general meeting: Left to right, Messrs. H. W. Cole, H. F. K. Dearlove (Fyfe, Wilson & Co.), W. MacMahon (Burdette & Co.), E. J. Ferguson (Britannia Manufacturing Co.), W. E. Lawton (chairman), R. H. Gill (Midland Dynamo Co.), G. H. Holding (Newman Industries), R. C. Hull (Universal Electrical Co.), T. A. Atkinson, E. H. Crook (Dynamo & Motor Repairs) and J. T. Morgan, secretary

Radiolocation Convention

Comprehensive Survey of Wartime Developments

THERE was a very full attendance at the inaugural session, with overflow meetings, of the four-day Radiolocation Convention in London last week, organized on behalf of the Council of the Institution of Electrical Engineers by the Radio Section Committee in collaboration with the Operation and Technical Committee ("OPTEC") of the Radio Board with expositions from Government research establishments, the universities and manufacturing organizations.

The Convention gave an opportunity to engineers and physicists to review the development in Great Britain of short-wave radio and radar (reflected, or triggered response) systems during the war, both functional and operational.

About 800 people attended the opening meeting, including prominent men from France, Norway, Holland, Switzerland, Poland, Russia, Canada and the United States. The audiences forming the overflow meetings not only heard the proceedings through loudspeakers but also saw duplicate sets of lantern slides. The proceedings were relayed by direct telephone line to the Telecommunications Research Establishment at Malvern in Worcestershire and to the Admiralty Signal Establishment at Whitley in Surrey.

Of nearly 200 contributions, 69 papers and expert lectures by 90 authors, some of them jointly compiling several papers, were presented.

The subject matter was divided into eight sections, in each case generally surveyed in one or two introductory papers, which were followed by a number of short supporting lectures dealing in more detail with specialized aspects.

Introductory Background

DR. P. DUNSHEATH (president I.E.E.) presiding at the inaugural meeting, said that the Convention would record both individual and collective achievements. Without co-operation the war would not have been won; with it, the future was limitless. Was it too much to hope that the example set by engineers would be followed by others when planning for the future?

MR. JOHN WILMOT (Minister of Supply and of Aircraft Production) expressed the thanks of the Government and of his Ministry in particular to members of the I.E.E. for their services to the nation during the war, and to the electrical industry for producing equipment, which was always ahead of that of the enemy in design and performance. The enormous strides taken by science during periods of war were perhaps due to the opportunities then given to scientists; the significance of which should not be overlooked when making post-war plans.

SIR ROBERT WATSON-WATT (Radio Board) followed with a survey of the evolution and development in this country of radar, filling practical details into the general scientific background described by Sir Edward Appleton in his Kelvin Lecture last year. It would be foolish to claim priority in inception for either Britain or America, but this country's contribution was a truly great engineering enterprise. It occupied about one-half of the one per cent of the population which was directly engaged in developing, producing, installing, maintaining and operating radio equipment for war purposes.

The expenditure on the production of radio material and on the engineering services immediately related thereto approximated to £1,000,000,000 during the six years of war. A substantial fraction of that sum was spent during the four years of active defensive preparation which followed the inception of radiolocation in February, 1935. About one-half of the wartime expenditure, and a much greater fraction of the immediate pre-war radio expenditure, was on radiolocation.

Sir Robert next embarked upon definition, dividing radar into three main types. The basic arithmetic, he said, was simple, the basic engineering was clearly practicable, but the economics were formidable. The civil engineering and building services of the home coastal chain of stations alone cost nearly £10,000,000 in the 1935-45 period. The solution of important problems was governed by available components; basic tools were available, but they needed reshaping and sharpening. The electrical and radio industries triumphantly satisfied demands of great variety, exasperating rate of change and intolerable urgency.

The Royal Air Force alone raised its

demands for radio equipment from £176,000 in 1935 to nearly £12,000,000 in 1940 and the pre-war radio industry of £20,000,000 grew to £120,000,000 annually in wartime.

Sir Robert concluded his address by naming and dating a dozen milestones of evolution and quoting examples of the ways in which radio and radar aids multiplied by a large factor the war-waging value of every arm of the three fighting services.

American Tribute

DR. F. B. LLEWELLYN (Bell Telephone Laboratories), who was present as president of the Institute of Radio Engineers of America, paid a graceful tribute to British workers. He described the taking to America of the first magnetron (a British invention) which became fundamental to radar systems. The device contained a multiplicity of tuned cavities, excited by the motion of electrons, furnishing 10 kW peak pulse output at about 3,000 Mc/s, which compared with the limit of 2 kW at 700 Mc/s of triode transmitting valves then employed.

But no equipment then in use in the United States was suited to the new generator. Either an entirely new radar system would have to be built up, or the magnetron scaled down to operate at lower frequencies. It was decided to do both and this led to enormously improved magnetron operation and coincident developments, showing that the many kinds of radar did not "just grow," but were the accomplishments of a truly joint effort.

Sectional Meetings

The lecture theatre was full for first of the eight sectional meetings over which MR. A. H. MUMFORD presided as chairman of the I.E.E. Radio Section.

Two co-ordinating introductory papers were presented. MR. J. A. RATCLIFFE (Cavendish Laboratory, Cambridge, formerly M.A.P.) surveyed the principles on which radar aerials were designed, differentiating between "flood" and "beam" types for metre wavelengths and indicating the possibility with centimetre waves of projecting beams so sharp that complications due to reflections from the ground could be avoided to a large extent.

DR. M. H. L. PRYCE (Trinity College, Cambridge) explained why hollow wave guides became of practical importance with the advent of centimetre wavelengths. Because of their small attenuation and large power-handling capacity, they were now the standard form of feeders to equipment operating on very short waves. But they would transmit energy freely only above a critical frequency and were of rectangular cross-section to ensure single-mode propagation.

Seven supporting specialist lectures were by DR. D. TAYLOR (Telecommunications Research Laboratory) on various kinds of aerials for ground radiolocation, and DR. H. G. BOOKER (Cavendish Laboratory) on slot aerials, utilizing Babinet's optics principle which permits almost any construction of wires to be translated into complementary arrangement of slots in metal sheets. MR. D. W. FRY (Telecommunications Research Establishment) was concerned with slotted linear arrays, while DR. O. BOHM (Admiralty Signal Establishment) described robustly constructed horn-cheese aerials for projecting a fan-shaped beam.

MR. E. WILD (Cavendish Laboratory) dealt with wave-guide matching methods, and MR. N. M. RUST (Marconi's W.T. Co.) with the phase correction of horn radiators; DR. L. W. BROWN (B.T.H. Co.) explained the production testing of wave guides.

Propagation Effects

In the first of two papers "integrating" propagation studies DR. H. G. BOOKER dealt with some of the elements of radio meteorology, showing how weather and climate caused unorthodox radar "vision" beyond the geometrical horizon. That phenomenon of super-refraction was associated with the occurrence of "ducts" close to the surface of the earth, being qualitatively similar to a wave guide of metallic pipe form, but ceasing to guide the longer waves because sufficiently large ducts did not occur in the atmosphere. Super-refraction was essentially a fine-weather effect, tending to be intense in tropical (but not equatorial) climates.

MR. E. C. S. MEGAW (Admiralty Signal Establishment, formerly G.E.C. Research) surveyed experimental studies of the propagation of very short waves in Britain during the war. His paper was largely descriptive, but it contained a summary of tentative conclusions. Its scope was not limited to factors dominantly influenced by the atmosphere, diffraction, reflection and scattering being also briefly dealt with.

The six supporting specialist lectures were by INSTR. LT. CDR. F. L. WESTWATER (R.N. Met. Service) on measurement of the refractive index gradient at sea, which revealed a state of great complexity, and MR. J. W. RYDE (G.E.C.) commented on the attenuation of centimetre waves and echo intensities resulting from atmospheric phenomena. DR. R. L. SMITH-ROSE (National Physical Laboratory) examined the results of preliminary investigations of the way in which transmission of short waves over land and sea was associated with meteorological conditions.

LT. B. S. STARNECKI (Signals Research and Development Establishment, Ministry of Supply) analysed observations made for the study of

some of the factors influencing microwave propagation, MR. J. M. C. SCOTT (Radar Research and Development Establishment, Ministry of Supply) spoke of the theoretical estimation by calculation of field strength, and MR. T. L. ECKERSLEY emphasized the importance of theory in the development and understanding of radar propagation.

Extra-tropospheric Influences

In a longer evening lecture SIR EDWARD APPLETON (Department of Scientific and Industrial Research) remarked that the afternoon topic had been the influence of the troposphere (low-level reflection, refraction, absorption, scattering) which fortunately usually assisted the propagation of ultra-short waves. But his task was to mention two phenomena which might occasionally be troublesome and in very rare cases completely upset radar operation within a certain wave-band.

The first adverse agency was unwanted echoes from the ionosphere; their effects could be minimized by frequency selection according to theories which Sir Edward had helped to develop. The second consisted of noise originating in stellar congregations as well as solar. The galactic noise (originating in the "Milky Way") now being detected by ultra-shortwave receivers must have been travelling for 30,000 light-years.

Recently Mr. J. S. Hey and Sir Edward had presented evidence which they had interpreted as indicating the existence of electromagnetic radiation in the solar radio spectrum, emanating from sunspot regions, greatly in excess of the previously accepted black-body intensity within the metre waveband. Thus technical achievements of radar workers would benefit both solar physicists and astro-physicists almost to the same degree.

Cathode-ray Indication

In the first of two introductory papers MR. J. G. BARTLETT (Radar Research and Development Establishment, Ministry of Supply), with MR. D. S. WATSON (Admiralty Signal Establishment) and MR. G. BRADFIELD (Telecommunications Research Establishment, M.A.P.) surveyed the many different uses of cathode-ray tubes in the Services. This means of presenting radar-found information to the operator could convey far more in a more compact form than any kind of meter. Investigations were proceeding towards the production of a tube which would be a meter in itself.

Up to five simple patterns on one screen could be appreciated at a glance. The simplest display, which was used for measuring range, differed little from the conventional oscillograph, except that indications along the time axis had to be of considerable accuracy. The amplitude of received signals was delineated against the time axis to furnish a panoramic view of all the obstacles in the beam path of radar aerials, thus displaying the positions of targets along a range axis. It was possible to indicate the distribution of targets in two dimensions of space by introducing brightness modulation as a third variable.

A complementary paper by MESSRS. L. C. JESTY (Cossor), H. MOSS (G.E.C.) and R. PULESTON (E.M.I.) broadly outlined the wartime history of cathode-ray tubes from the designer's point of view. Notwithstanding semi-mass production, automatic pumping of the smaller tubes and assembly assisted by relatively elaborate jigging, it was likely that improved performance for television purposes would not be so marked as might have been expected.

In the first of three supporting lectures DR. G. S. J. GARLICK (Telecommunications Research Establishment, University of Birmingham) with DR. S. T. HENDERSON and MR. R. PULESTON dealt with the development of cathode-ray tubes for radar and the measurement of intensity modulated displays, while DR. R. G. HOPKINSON (G.E.C. Research) spoke on the visibility of screen traces and MR. P. G. R. KING (Admiralty) discussed the skiatron (dark trace) type of tube, which was of little use for television in its present form.

In the second evening lecture MR. W. A. S. BUTEMENT (Ministry of Supply and Aircraft Production) with MESSRS. B. NEWSAM and A. J. OXFORD discussed precision radar methods of determining the position of a single object in space, working from a single station. The future course of events might be divided, for it seemed likely that an entirely fresh approach would be needed for locating rocket projectiles moving at speeds more than four times greater than that of the fastest aircraft.

Modern Valves

The third subject was introduced by DR. J. H. E. GRIFFITHS (Clarendon Laboratory, Oxford) who briefly indicated the remarkable improvements that had taken place in the design of some of the many valves, their performance and novelty of construction. Since the common valve (CV) system of numbering was introduced in 1941, more than 220 numbers had been allocated to new types, not counting slight modifications. The main call was for ever more sensitive receivers and more powerful transmitters, some with a peak pulse 1,000 times the mean power. The largest output so far obtained from a completed valve design was about 2,500 kW with an input of 5,000 kW, the mean being of the order of 3 kW.

Mention was made of the "pre-production" system for making small but regular quantities of new valves for testing. The magnitude of that branch of manufacture was indicated by the fact that in 1943 the G.E.C.–M.O.V. organization pre-produced over 80,000 valves of 29 different special types.

In the first of the seven supporting lectures PROF. J. T. RANDALL (St. Andrew's University) and DR. H. A. H. BOOT (Birmingham University) outlined early work on the cavity magnetron (short wave transmitting valve) as an example

of what could be achieved in a university laboratory in wartime. The later history of that novel device was an equally good example of what could be done by international co-operation between university and industrial institutions.

MESSRS. W. E. WILLSHAW (G.E.C.) and L. RUSHFORTH (B.T.H.) followed with an explanation of the mode of operation of the magnetron and the benefit of secondary emission of electrons which enabled 40-A pulses at 10-cm wavelength to be obtained with a primary of a few milliamperes only.

DR. L. F. BROADWAY (E.M.I.) dealt with velocity modulation valves and DR. B. BLEANEY (Clarendon Laboratory) with the crystal valve, the receiving sensitivity of which could not be rivalled by any vacuum tube on centimetre wavelengths. DR. A. H. COOKE (Clarendon Laboratory) was concerned with gas-discharge switches (valves) for enabling a single aerial to be used for both transmitting and receiving; MR. J. BELL (G.E.C.) with triodes for very short waves; and MR. H. DE B. KNIGHT (B.T.H.) with mercury-vapour thyratrons for radar modulator service.

Measurements and Tests

The account presented by MR. C. B. OATLEY (Engineering Laboratory, Cambridge) indicated progress made in measurements of all kinds, up to the highest frequencies at present in use and which facilities still fell short of requirements, or desired accuracy.

In following specialist lecturettes MR. L. B. TURNER (lately Admiralty Signal Establishment) described multi-probe monitors for exploring the power and reflection of centimetre transmitters, while DR. J. COLLARD (E.M.I.) dealt with the use of a gold-leaf electroscope for the same purpose and of the enthrakometer for measuring the power in a rectangular wave guide.

DR. B. BLEANEY explained how signal-generator and noise measurements were made; DR. L. ESSEN (N.P.L.) commented on the determination of the electrical properties of high frequency cables insulated with polythene and PROFESSOR WILLIS JACKSON (Manchester University) reviewed resonance methods of ascertaining the permittivity and power factor of dielectric materials at extremely high frequencies.

MESSRS. J. DYSON and B. A. C. TUCKER (B.T.H.) explained an automatic contour plotter for investigating radiation patterns from directive antennae. The system could also be employed for rapidly plotting any quantity that was a function of two others, in particular the equipotentials of electrostatic fields when studied in an electrolytic tank. More than a dozen equipotentials could be plotted at one time, the speed of operation exceeding 15 times that of hand plotting. MESSRS. H. ARCHER-THOMSON and E. M. HICKIN (G.E.C.) described apparatus for, studying centimetre-wave propagation as devised for the Admiralty.

Shipborne radar was the subject of the third evening lecture in which MR. A. W. ROSS (Admiralty Signal Establishment) remarked on the steadily increasing complexity of naval equipment. He spoke first of means of displaying and distributing the information collected by radar, then on various ways of stabilizing ships' aerials and the reduction of polar-diagram side lobes. Sea clutter in receivers due to reflection from the water, transmitter instability with long aerial feeders and interference received attention as well as design features, both special and navigational.

Transmitters and Receivers

MR. O. L. RATSEY (Admiralty Signal Establishment) traced technical advances during the 1935-45 decade, commencing with the first 12-metre outfits and concluding with elements of a 3-cm unit, with special reference to the modulating side and circuit fundamentals of the duplexing (TR switching) devices.

This record of the major phases of Service developments "integrated" subsequent lecturettes by MR. R. V. WHELPTON (Royal Aircraft Establishment) and DR. ING J. M. DODDS (Metro-Vick.) on ground transmitters for warning and aircraft location. MR. T. S. ENGLAND (Telecommunications Research Establishment, R.A.F.) gave circuit details of a fixed-frequency decimetre transmitter, turntable model, of 100 kW as well as of a four-valve parallel push-pull arrangement for 400-kW output, the valve life being about 250 hours.

MR. K. J. R. WILKINSON (B.T.H.) revealed the development of high power modulators for radar, while MESSRS. D. F. GIBBS and B. W. LYTHALL (Admiralty Signal Establishment) dealt with pulsed transmitters for 3,000 Mc/s, the extraction of energy from the magnetron and its tuning; also the common use of one aerial for transmission and reception.

Radar receivers were reviewed by DR. W. B. LEWIS (Telecommunications Research Establishment) who showed that by far the most work had been directed towards reducing the noise factor in amplifiers and mixers, so guiding the development of respective types of valves.

In subsequent lectures MAJOR H. DAHL (Admiralty Signal Establishment) outlined the design and performance of a pre-tuned 10 cm. frequency changer; MR. W. L. WATTON (E.M.I.) reviewed intermediate frequency amplifiers; MESSRS. F. L. HUMBER, R. S. PAULDEN and M. K. TAYLOR (Ferranti) described the marine type-255 radar-responder marker buoy; DR. ING. G. G. MACFARLANE and MR. J. R. WHITEHEAD (Telecommunications Research Establishment) discussed the operation in the linear mode of super-regenerative receivers.

Circuit Technique

The term "circuit technique" has a special meaning in radar which is best defined by the contents of this seventh group of papers, introduced by DR. F. C. WILLIAMS (Tele. Res.

Est.) who said the scope of that phrase included the generation of wave forms and their manipulation to satisfy specific needs (to which his paper was limited) and also servo mechanisms of the instrument type with their associated special amplifiers.

In the subsequent lectures, MR. R. BENJAMIN (Admiralty Signals Est.) dealt with blocking oscillators of various kinds; MR. N. F. MOODY (Tele. Res. Est.) provided an introduction to the theory of low-power pulse transformers and their uses; and DR. E. L. C. WHITE (E.M.I.) spoke of the use of delay networks in pulse formation. DR. D. C. ESPLEY (G.E.C.) described the generation of very short pulses and MR. H. R. WHITFIELD (H. Hughes & Co.) showed how light-weight radar gear depended on low-consumption circuits. DRS. F. C. WILLIAMS and A. M. UTTLEY (Tele. Res. Est.) explained the "Velodyne" servo system of control in which a feedback amplifier is employed to maintain a relationship between input and output of an actuating motor. DR. WILLIAMS and MR. F. J. U. RITSON (Tele. Res. Est.) also lectured on automatic strobes and recurrence-frequency selectors.

In the last evening lecture DR. R. A. SMITH (Tele. Res. Est., M.A.P.) reviewed the principal ways in which radar had been employed as an aid to the navigation of aircraft as the primary system, backed with dead reckoning methods.

A final extra-Convention meeting took place during the afternoon of April 3rd, when five papers (from the Admiralty Signals Establishment) were presented. The first by MESSRS. J. F. COALES, H. C. CALPINE and D. S. WATSON gave an account of the way in which radar had revolutionized the control of naval gunnery because continuous ranging of relative high accuracy replaced intermittent and inaccurate optical methods. The tracking of targets in polar co-ordinates was described in some detail; an account was also given of the way in which shell splashes could be located in relation to the position of the target for correcting the calculated future position.

MR. R. V. ALRED related the results of research into the effect of a cylindrical parabolic reflector on a switched-beam directive aerial for 600 Mc/s. A paper by MR. C. A. LAWS, with an appendix by MR. E. PARKER, dealt with precision ranging equipment using a crystal oscillator as as a timing standard, while MR. H. W. POUT was concerned with precision ranging systems for close-range weapons.

Finally MR. H. A. PRIME dealt with the design and applications of medium precision ranging equipment for simple tactical needs, avoiding the complexity of large ships' requirements.

Supply at a Hayes Estate

A PRIVATELY-OWNED electricity undertaking which supplies 810 houses on the Wood End Park Estate, Hayes (Middlesex), figured in a case before His Honour Judge Tudor Rees at Brentford County Court last week. Mr. M. V. Patel, company director, Hayes, landlord of 106 of the estate houses, sought possession of one of them from Mr. E. Morrish, secretary of the Wood End Park Residents' Association. He also claimed rent arrears since October last year and mesne profits.

Mr. Donald McIntyre, for plaintiff, said the estate was built by a Mr. J. Williams, who supplied his houses with water and electricity from a private plant. Mr. Williams had mortgaged his estate in various lots to three or four building societies, one of which was the Princes Park Property Trust, Ltd., which took sole control of the plant. The Trust was now controlled by a receiver. The tenants occupying houses on land owned by Mr. Patel got electricity and water from the plant, and the receiver could supply or cut off at will. The lights were cut off in January this year, since when the tenants had been using candles and hurricane lamps. The receiver maintained that the tenants were entitled to use only a certain quantity of electricity, and had been warned of the danger of a breakdown if they used electricity for more than lighting.

Mr. Morrish told the Judge that his Association organized a rent strike in September last year on account of bad water and unsatisfactory lighting. They wanted to force the hands of higher authorities and get a statutory supply. Describing the lighting, he said that a 24-hour service had never been available, the average being about nine hours daily. The agreed supply was 225 V, but it had never exceeded 190 V and was often as low as 175 V. When he entered into a tenancy he found a three-bar electric fire would not work. Since then he had never used any appliances, although he agreed that some tenants might have used fires and irons, but they were in the minority. Most tenants tried to economize and not to overload the undertaking.

At this point the Judge and counsel for both parties twice retired for private consultation and it was later announced that agreement had been reached. His Honour, concurring, gave judgment for 13s. 3d. weekly rental from October last year, the possession claim to be abandoned, and no costs. Another twenty-six similar cases would be adjourned generally and he hoped that he would hear no more of them.

In a lengthy summing up, His Honour said that such conditions should not prevail a moment longer than was necessary. The tenants had combined to do away with the privately-owned supply. He hoped the proper authorities will take immediate steps to see that this estate got the social amenities to which it was unquestionably entitled.

ELECTRICITY SUPPLY

London Joint Working Plan. Proposed South Wales Station.

Bexhill.—HIRE AND HIRE-PURCHASE.—The Electricity Committee has decided for the time being to confine the hire system to the medium-size cooker and the 1½ and 3-gall. water heaters. The larger sizes and de luxe models are to be offered on the following hire-purchase terms:—Cookers, list price plus 12½ per cent spread over five years; water heaters, list price plus 10 per cent over three years. Full maintenance will be provided for a year, after which the consumer will pay for replacements at cost.

Birkenhead.—POWER STATION APPROVED.—The Electricity Commissioners have approved a scheme for the erection of a £6,250,000 power station on the River Mersey at Bromborough. They have consented to the Corporation's borrowing £3,560,600 out of a total of £4,291,910 for the first section (100,000 kW) and have given formal instructions for the second section of the scheme to be proceeded with.

Burton-on-Trent.—FURTHER RELIEF OF RATES.—In view of special circumstances, the Electricity Committee has agreed that £7,500, in addition to the £2,500 already approved, shall be provided for the relief of the rates.

Chapel-en-le-Frith.—STREET LIGHTING. — The Trent Valley and High Peak Electricity Co., has prepared a scheme for street sodium lighting costing £1,250.

Colwyn Bay.—EXTENSIONS.—The Lighting Committee has decided to extend the supply of electricity in the Glan Conway area, commencing from Nant-y-Glyn to Fforddlas. The scheme is estimated to cost £18,000 and the annual revenue is estimated at £1,048.

Darwen.—DOMESTIC INSTALLATIONS.—The Corporation is applying for sanction to borrow £2,008 to install electricity in sixty-three houses on Greenway estate.

Gateshead.—DEFERMENT OF PURCHASE OPTION.—In view of the Government's plans to nationalize the electricity industry, the Town Council has decided to take no action at present regarding its option to acquire the undertaking of the North-Eastern Electric Supply Co., Ltd., in the area.

Gravesend.—TRAINING SCHEME.—The Town Council is to establish a training scheme for employees.

LOANS.—Application is to be made for sanction to loans for supplying electricity to the all-electric temporary houses in Gravesend (£4,430) and Northfleet (£2,750). Approval has also been given to a loan for modernizing the Pelham Arms substation and the reconstruction of the surrounding low-voltage network, expected to cost £6,350. Another loan of £11,180 is being sought to cover the augmenting of a supply to a large industrial consumer.

Hammersmith. — LOWER CHARGES. — Since October, 1941, the tariffs for electricity have in most cases been subject to an increase of 33⅓ per cent. In view of the estimated surplus for 1946-47, however, it has been decided to reduce the surcharge to 25 per cent, with effect from April 1st. In the case of tariff No. 8 the addition is reduced from 15 to 10 per cent, and on tariffs Nos. 5 and 11 from 27½ to 20 per cent.

Hull.—ADMINISTRATIVE STAFF SALARIES.—At a meeting of the Electricity Committee Mr. D. Bellamy (general manager) submitted a schedule showing the adjustments recommended under a new national agreement governing the salaries of administrative and clerical staffs. He said that 190 personnel of the Department were affected and the increased cost in the first year would be £1,000, with an ultimate final cost of about £10,000. The lowest grade under the new scale was £360, including bonus, for men clerks at thirty years of age, and £285 for women.

Jarrow.—STREET LIGHTING.—The Borough engineer has been asked to report on the town's street lighting, with reference to a proposal to introduce electricity in place of gas.

London.—J.E.A. REPORTS.—At yesterday's meeting of the London & Home Counties J.E.A. the General Purposes Committee reported the receipt of a copy of a proposed agreement between the City of London Electric Lighting Co. and Central London Electricity, Ltd., providing for the joint working of the two companies' undertakings in the City of London. The draft is to be considered and appropriate representations will be made to the Electricity Commissioners.

The Technical Committee referred to the resumption of the change-over from D.C. to A.C. in the Finchley area at an estimated cost of £150,000. The Electricity Commissioners' attention is to be drawn to the fact that the voltage of 230 proposed does not conform to the new standard (240V) recently approved.

Morecambe.—NEW FEEDER.—The Electricity Committee is to provide a new feeder from Lancaster power station to Westgate substation.

Nottingham.—CHANGE-OVER.—The Corporation is to make a start on the work of changing over from D.C. to A.C.

South Wales.—POWER STATION SITE.—The South Wales Electric Power Co. has applied for a compulsory purchase order in respect of a site at Llanover where it is proposed to build a 100,000-kW power station. The plan is meeting with opposition on the ground that the scheme would spoil the countryside and injure the fishing amenities of the River Usk.

Stoke Newington.—APPARATUS AND INSTALLATIONS.—For old cookers, including any pre-war models which may be purchased, existing rentals are to be continued, but a kettle and wiring will not be included in future. Kettles are to be issued on hire at 2s. per quarter, and a charge of 3s. per quarter will be made for cooker wiring until the cost has been recovered. For post-war model cookers, wash boilers and water heaters the rentals will be increased by 33⅓ per cent (e.g., standard cooker from 7s. 6d. to 10s. per quarter). The hire-purchase scheme is to be resumed on the terms in operation in 1939. It is proposed to set up an installation depart-

ment to carry out any wiring work required in connection with the provision of cookers, wash boilers, water heaters and other apparatus. Consideration of the assisted wiring scheme has been adjourned until the Council is in a position to undertake the necessary wiring work by direct labour.

HIGHER CHARGES.—Subject to the approval of the Electricity Commissioners, electricity charges are to be increased as from the beginning of the September quarter next as follows:—Scale 1 (lighting quarterly and prepayment meter rate): from 5½d. to 6d. per kWh, and from 7d. to 7½d. where the wiring is owned by the undertaking. Scale 2: from £3 per kVA of lighting installed or demanded per quarter and ½d. per kWh consumed, to £12 10s. per kVA per annum and ¾d. per kWh. Scale 3 (power): from 1¼d. per kWh up to 10,000 kWh per annum and thereafter 1¼d., to 2¼d. per kWh for all energy consumed. Scale 5 (combined lighting and power for private residences) remains as before, but is subject to a minimum quarterly fixed charge of 4s. 6d. Scale 6 (domestic cooking and heating) is increased from 1d. to 1¼d. per kWh.

FINANCIAL ASSISTANCE.—Representatives of the Council, discussing the question of financial assistance to the authority, were recently informed by the Accountant-General that the amount of the electricity undertaking's deficiency, which had been charged to the general rate fund, viz., £10,545, was to be repaid over a period of five years and considered to be part of the general fund for repayment purposes.

Sunderland.—RELIEF OF RATES.—Sunderland Town Council is being recommended to take £12,500 from the electricity undertaking to relieve the general rates.

APPARATUS FOR COUNCIL HOUSES.—As the North-Eastern Electric Supply Co., Ltd., has declined to provide electric cookers and wash boilers for hire or hire-purchase by prospective tenants of Council houses the Town Council is to install cookers and wash boilers itself.

Watford.—INDUSTRIAL SUPPLIES.—To supply a large consumer in Leavesden a 6,600-V feeder cable is to be provided at a cost of £11,550, together with plant costing £2,920.

York.—HIRE OF COOKERS.—The Housing Committee has informed the gas company and the Electricity Department that it is likely that 100 gas and 400 electric cookers will be required soon for new houses.

Overseas

Australia.—NEW ACQUISITION MEASURE.—It is reported that the South Australian Government has recently introduced another Bill for the acquisition of the undertaking of the Adelaide Electric Supply Co., Ltd. Last December the original Bill, by which a South Australian Electricity Trust would have been established, was rejected by the Legislative Council (Upper House) after having been passed by the House of Assembly.

Canada.—B.C. POWER COMMISSION.—Expansion of the hydro-electric development programme of the Power Commission was forecast in the policy speech in the British Columbia Legislature recently by the Premier, Mr. John Hart, who said the Commission proposed to spend $7,365,925 on capital projects during the fiscal year of 1946-47. Development work to be undertaken would cover Vancouver Island, the Okanagan and Kootenays and the northern interior of British Columbia. In its first five months operation of three utility groups taken over last August the Commission had made a surplus of $296,987, which would be used to reduce rates. The Campbell River project would be stepped up to 100,000 H.P. by the construction of a dam at Ladore Falls some distance above Elk Falls on Campbell River. A smaller dam is now being built at Irene Pool just above the falls.

TRANSPORT

Bradford.—TROLLEY-BUSES.—The Transport Committee is to convert the Bradford Moor tramways to trolley-bus operation at an estimated cost of £50,500.

Newcastle-on-Tyne.—LOSS ON TRAMS EXPECTED.—Mr. N. H. Chapman, chairman of the Finance Committee, said recently that the tram system this year would show a very heavy loss and it would be necessary to take £35,565 from the reserve fund to balance the account. He expected that the position would rectify itself when the conversion to trolley buses was completed.

Power Plant Manufacture in Russia

DESPITE heavy war damage, the main shops in the Stalin works at Leningrad are in operation again and are reported to be building a new type of turbine designed by the chief engineer, Michael Bushruyet, the first example of which is to be sent to the Stalinogorsk power station, which supplies Moscow. This turbine, rated at 100,000 kW at 3,000 r.p.m., will operate at 1,320 lb per sq. in. and 865 deg F, compared with pre-war values of 425 lb and 750 deg. The low-pressure cylinders will be welded instead of cast, thus reducing their weight by one-third and cutting down machining time by more than one half. By making some of the blades of stamped material, the amount of stainless steel will be reduced by 55 per cent. The ultimate aim is to build turbines for steam conditions of 2,500 lb per sq. in. and 930 deg F.

From the Stalin works will also come six of the nine water-turbines for the reconstructed Dnieper hydro-electric station; the other three are to be imported from the United States. The turbine wheels of the Russian sets will be in one piece with an outside diameter of 20 ft. and a weight of 100 tons, entailing problems of rail transport. The manufacture of uniflow water turbines working at high pressures is being considered with a view to cutting down costs and simplifying installation work. All those working at the Stalin plant are obliged to attend classes at which they gain some technical knowledge. Supervisory grades take courses at the Leningrad Technical Club or as arranged for them by the Society of Machine-Building Engineers and Scientists.

—IVAN BONDARENKO.

PARLIAMENTARY NEWS

By Our Special Reporter

Trading Opportunities Overseas

IN the House of Commons last week Mr. Marquand, replying to a question to the President of the Board of Trade, said that in order that our exports might reach the volume essential for our national well-being, it was necessary that exporters should have the fullest possible information on conditions in overseas markets. They were being encouraged to send their own representatives abroad to study such conditions and arrangements had also been made for Commercial Diplomatic Officers and Trade Commissioners to submit continuous general reports and economic reviews.

In addition discussions between the Board of Trade and the British Export Trade Research Association has resulted in a working arrangement whereby as soon as B.E.T.R.O. had been able to engage the necessary trained personnel for posts abroad and to send out special investigators, it would be in a position to provide for its members more detailed reports which would supplement the general reports which are made by the Commercial Diplomatic Officers and Trade Commissioners. To ensure the closest possible working between the Government services and B.E.T.R.O., to avoid duplication of effort and to give maximum service to exporters, a joint committee of the Department and that Organisation would be set up to review results periodically and to arrange forward programmes.

Voltages and Housing Delays

During a debate on the supply of building materials, Mr. H. Wilson, the Parliamentary Secretary to the Ministry of Works, said that one of the difficulties was that they were working on very narrow margins of materials with nothing left over for " buffer " stocks to deal with any changes or any temporary lack of balance in the programme.

For instance they had no margin in the supply of electrical fittings to cover variations in voltages from one area to another, which was one of the characteristics, unfortunately, of the electricity distribution of this country. Very often they found that they had pushed ahead with fittings of a particular voltage for one area whose houses were expected to be ready first and, in the event, another area was ready first, and although they might have enough electrical fittings in total for their needs, they were for the wrong voltage, and therefore the houses were standing unfinished and empty.

Mr. Orr-Ewing asked if the Minister was really suggesting that the number of areas in this country which were not on standard voltage was so great that it was really an embarrassment to the supply of electrical equipment.

Mr. Wilson replied that Mr. Orr-Ewing would be surprised if he had the facts which the Ministry had. They were having cases brought to them every day.

The Scottish Board

On March 26th Mr. Cook asked the Secretary of State for Scotland if he would give an assurance that no member of the North of Scotland Hydro-Electric Board had any connection with any firm or firms who had undertaken or would be undertaking contracts for the Board.

Mr. Westwood said that the first schedule to the Board's Act stated that a member must disclose his interest in any company with which the Board had made or proposed to make a contract and must not take part in any deliberation or decision in regard to such a contract.

Water Heaters

Mr. Gammans asked the Minister of Works what answer he had given to the Electrical Development Association in reply to its memorandum pointing out the inefficiency of the water-heater installations in temporary houses ; if these defects were being remedied in houses under construction ; and why, in view of the wastage of current, they could not be rectified in houses already finished.

Mr. Tomlinson said his Department had already been in touch with the Electrical Development Association and further discussions were to take place with the Association and other interests concerned. He was not at present in a position to say more than that one of the recommendations of the Association was being adopted for future use.

Atomic Energy and Electricity

On March 28th Lt. Col. Martin Lindsay asked what the Government was doing to develop the industrial aspect of atomic energy. He believed that the sound development of nuclear power would enable us to put the British national economy, which was at present based on coal, on a sound, permanent footing, if the central planning organization of the Government took appropriate action years in advance. It simply did not " make sense " to read that the Central Electricity Board was, at the present moment, proposing to spend £300 millions in the next ten years upon power stations, which he believed, would be out of date before they were completed.

Mr. Blackburn said the most immediate benefit to be derived from atomic energy would arise from medical research and therapy. It was unfortunate that our co-operation with the United States on the peaceful development of atomic energy was most unsatisfactory. He

hoped that the Government would be able to give an assurance to Parliament that steps had been taken to acquire all the uranium and thorium in the British Empire. The Central Electricity Board's programme was an example of plans being made by industry, which very largely depended upon exact knowledge of the Government's programme in relation to atomic energy and what its outcome was likely to be.

Mr. P. Roberts said it was most necessary to know whether atomic energy could be applied to industry within, say, three or ten years, or whether it would take 50, or even 70 years, as he thought much more likely.

Mr. Wilmot, Minister of Supply and of Aircraft Production, said that there was no justification for the belief that there was a quick or easy solution of these industrial problems. It must be some years before practical results of industrial value could be achieved. In the present state of knowledge it was doubtful if the achievements of the next ten years could be of widespread industrial application. He thought it most likely that atomic energy would be used for the production of electric power, by using the heat in steam or gas turbines in big rather then small units. Atomic energy plant produced intense radiation that was lethal if not screened. The weight of that screening must amount to many tons. It was not impossible, however, that a way might be found to use nuclear energy for large ships.

Electricity generated by atomic energy would be distributed in the normal way and the cost of fuel was the smaller part of the cost of the production and distribution of electrical energy. Except where the normal generation of electricity by the normal known means was for some reason excessively costly, it would be a long time before atomic energy would have any economic significance.

Radio-active materials might have a most valuable industrial application, replacing X-rays and radium. The prospects of this country were very bright in work to which British scientists had made an immeasurable contribution. The United States had acquired a very valuable technical experience and we were not fully seized of all the technical aspects, but very valuable experience was being gained through the project which was now going on, mainly financed by the Canadian Government, and he hoped that co-operation with the United States would be developed and continued.

It had been decided that as much of the resources of this country as could be made available would be devoted to that work. The central planning was in the hands of the Prime Minister and the Cabinet, advised by a learned committee presided over by Sir John Anderson.

The research establishment which had been established at Harwell would be got going as soon as it was physically possible, and would be provided with every possible facility. The airfield had already been evacuated, and the work of converting the buildings to their new use was already under way. New, highly specialized buildings would need to be constructed, and a team of experts was at present in Canada preparing plans to incorporate the very latest knowledge. At the same time they were pressing on with the construction of the main production plant producing fissile material which the research establishment might require. Accommodation for the design team had been made available at the Ministry of Supply factory at Risley, near Warrington. Engineering and other expert staff was being recruited. Examination of sites for the main production plant was now going forward. Meanwhile the Ministry's factory at Springfields near Preston, had been selected for the site for a subsidiary plant for processing materials.

The Government's policy was to encourage and support in every way research at the universities and elsewhere on fundamental problems which might at any time lead to discoveries of prime importance in the field of nuclear energy.

Manchester Corporation Bill

The House of Lords Committee which is considering the Manchester Corporation Bill decided last week that it could not agree to the proposed trolley-vehicle route to Droylsden unless the Corporation was able to reach agreement with the operators of a motor-bus service at present running on this route.

The Silicones

PRODUCTION of the silicone group of substances, claims made on behalf of which by American manufacturers are not infrequently exaggerated, is another example of British industry's missing chances offered by fundamentally English research work.

A statement on the development and applications of organosilicon compounds issued from the Chemical Research Laboratory of the Department of Scientific and Industrial Research refers to early investigations at Nottingham between 1900 and 1937 as well as to the varieties now available in America, including insulation of most forms for fabricating electrical machinery, coating wires and impregnating glass fabrics to enable them to operate at appreciably higher temperatures with the normal expectation of service life. The water-repellent properties of silicone fluids have been used for improving the performance of ceramic insulators in wireless and radar sets and for "tropicalizing" them by spraying and dipping.

There are special greases for lubrication and for sealing sparking plugs and disconnectable junctions of ignition circuits to minimize corona discharge and leakage through moisture. A rubber-like variety has been used for naval searchlights and is heat-resisting. Experimental mouldings have been produced, but it does not appear to be likely that silicone "plastics" will be developed for some time to come.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

North-Eastern Electric Supply Co., Ltd.—At the company's annual meeting last week Mr. R. P. Sloan (chairman), said they did not know by what method nationalization might be applied to their industry ; no scheme had so far been made public disclosing in detail the Government's intentions. He felt it would be disastrous if the distribution of electricity throughout the country were controlled from one central point in London. It was not suitable for control of that character, direct contact with all types of consumers being vitally important. He suggested that many disadvantages of small-scale operation could be avoided by merging distributing authorities into a comparatively few units combining urban and rural districts.

Dealing with the company's activities, he said that the extensions now in hand at Dunston (two 50,000-kW sets) and North Tees (two 60,000-kW sets), while not what they considered to be the most efficient scheme, would enable them to meet their immediate obligations. To that extent they represented a substitute, for the time being, for the Kepier proposal.

They had not increased their domestic tariffs during the war, but a continuation of the present high costs might make some revision necessary. In conclusion he spoke of his retirement from the chairmanship of the company and said he was proud to have taken some part in the development of the undertaking from very small beginnings to its present position.

London Associated Electricity Undertakings, Ltd.—After giving a survey of the progress made by the industry generally in refutation of any suggestions of inefficiency, Lord Lytton (chairman) turned to the affairs of the company's principal property, Central London Electricity, Ltd. Owing to its geographical position he believed it had suffered more damage and loss than any other of the large distributing companies, having lost 37½ per cent of its consumers and 30 per cent of its output. The industry, he said, was led to expect at one time that help for seriously affected undertakings might be anticipated from Treasury sources, but in the end nothing happened, except that municipal undertakings were helped by means of grants and loans in aid of rates. The amount of the company's claim for war damage exceeded £720,000, and the question of how much of this would be recovered was under discussion.

The return of consumers during the past year was very marked, and the net supplies connected exceeded 8,000. As compared with the maximum loss of 33,000 consumers during the worst period of the war, the number was now 3,000 below the 1938 figure. Sales during the year were 35 million kWh higher than in the previous year, but they were still 49 million kWh below the 1938 figure. Prices to consumers were of necessity, and with official permission, twice raised during the war years. He hoped that during the current year the first steps towards reducing prices could be taken, but that would largely depend on the trend of costs. The chairman also referred in the course of his speech to the agreement with the City Company by which a single distribution system could be planned. In one part of the area a start was being made again on the change-over from D.C. to A.C.

Midland Electric Corporation for Power Distribution, Ltd.—The chairman (Sir Alexander Roger) being at present engaged on a tour of the Americas for the purpose of improving British export trade, his speech at the annual meeting was read by the deputy chairman (Mr. G. R. J. Parkinson). The chairman said that they had substantial new industrial load in prospect which had been agreed as between the company and intending consumers but awaited sanction by the appropriate Government Departments. The removal of labour difficulties and restrictions would bring considerable additions to the installations of existing consumers. The demand for domestic electrical apparatus was greater than at any time in the history of the company and generally the prospects for expansion were good, but the pace would depend upon the supply of labour and materials. Referring to the nationalization proposals, he said they viewed with the greatest apprehension the imposition of national ownership and control upon their undertaking, which had a record of efficient personal service. They found it difficult to believe that the long-distance impersonal direction of nationalization would be an adequate substitute.

Northampton Electric Light & Power Co., Ltd.—Lord Henley (chairman) stated at the annual meeting that their sales and those of associated companies had risen from 108 million kWh in 1939 to 181 million in 1944, receding to 176 million last year. He hoped that before long the normal peace-time demand would increase sufficiently to cancel out this decrease. So far as possible they were proceeding with rural extensions, paying particular attention to the needs of the farmer. There had been no increase in general charges since the beginning of the war. Whether these cheap tariffs could be maintained depended upon factors outside their control. He pointed out that expenses of operation last year rose from £611,987 to £671,424, largely owing to the increase in the price of coal and in rates.

Bournemouth & Poole Electricity Supply Co., Ltd.—Figures given by Sir Robert Renwick (chairman) at the annual meeting showed that sales last year amounted to 124 million kWh against 121 million in 1944. Lighting, heating and cooking supplies rose from 63 million to nearly 71 million kWh, while power supplies dropped from 41 million to 35 million kWh (this, however, compares with a pre-war figure of under 10 million kWh).

Referring to the new 200,000-kW capital station to be erected in their area, the chairman said that the proposals had been approved by the local town planning authorities and the designs by the Royal Fine Arts Commission. Another important scheme was the reinforcement of transmission lines between Bourne Valley, Poole and Christchurch at an estimated

cost of £200,000, and the company was proposing to intensify general development, particularly in rural areas.

Speaking of the options of local authorities to purchase parts of the undertaking, he said that at no time had the company been challenged on the score of its charges. The options covered 64 sq. miles with 80 per cent of the total number of consumers; what would happen in an electrical sense to the people living in the remaining 300 sq. miles?

The Metropolitan Electric Supply Co., Ltd.—To the revenue account balance of £635,781 (against £680,507 for 1944) is added £318,530 (£306,679) from interest and dividends. Income tax takes £349,379 (£317,278) and war damage contributions £48,000 (nil). A sum of £128,192 (£49,099) is placed to reserve; last year £175,000 was also allocated to contingency account. As already reported, the total dividend for the year is 9 per cent (last year 8 per cent), £164,737 (£177,066) being carried forward.

Lancashire Dynamo & Crypto, Ltd.—The accounts for 1945 show a net profit, after taxation, of £135,210, as compared with £134,313 for the previous year. The staff pension fund again receives £3,000, and £27,000 (nil) is applied to the new staff pension scheme. Last year £100,000 was also placed to special reserve for post-war contingencies. With a final dividend of 10 per cent and a bonus of 7½ per cent the year's distribution on the ordinary shares is maintained at 22½ per cent, and £139,131 (£127,707) is carried forward.

Ericsson Telephones, Ltd., report a trading profit for 1945, after providing for depreciation, of £373,951 (against £414,371 for 1944). Taxation takes £90,672 (£161,634), and £138,867 (£105,000) is set aside towards future taxation, with £30,000 (same) for obsolescence, and fees amount to £1,500 (same), leaving a net profit of £112,912 (£116,507). With a final ordinary dividend of 12 per cent and a bonus of 3 per cent, the total distribution is again 20 per cent tax free; general reserve receives £20,000 (same) and £46,307 (£42,401) is carried forward.

Brown Brothers, Ltd.—Dr. J. A. Thomson, chairman and managing director, stated at the annual meeting that there were big problems facing the company in regard to new premises to replace those destroyed. He cited the case of Southampton where they were told they could not rebuild the fine premises which had been destroyed because the land was scheduled for residential flats. So far the Corporation had been unable to offer them any suitable alternative site. In two other towns road widening schemes cut right across the sites on which their buildings had stood. Dealing with the prospects of industry generally, he said that they could not obtain a plentiful supply of the necessaries of life by doing less work per man-hour than any other competitive nation; hard steady work was the only way out of their difficulties.

The Oriental Telephone & Electric Co., Ltd., which reports a balance on profit and loss account for 1945 of £20,547 (against £20,482), is maintaining its dividend for the year at 4 per cent.

The Lancashire United Transport & Power Co., Ltd., after providing £71,556 (against £115,854) for taxation, made a net profit last year of £28,749 (£38,720 for 1944). The final ordinary dividend is again 6 per cent (making 10 per cent for the year) and £16,170 (£13,158) is carried forward.

The Hoffman Manufacturing Co., Ltd., proposes to pay a first and final dividend of 7½ per cent tax free; last year an interim payment of 7½ per cent free of tax was made, with no final dividend. There was a loss for 1945 of £32,092, but £100,000 is being transferred from income tax reserve to profit and loss account. The profit for 1944, after transferring £25,243 from investment reserve, was £77,606.

Engineering Components, Ltd., is maintaining its final dividend at 15 per cent, again making 25 per cent for the year. The net profit was £26,588 (against £26,204).

The North Somerset Electric Supply Co., Ltd., is paying a dividend of 7 per cent (same) on the ordinary shares and a bonus of 2½ per cent (nil). The net profit for 1945 was £55,595 (against £62,880).

The St. Austell & District Electric Light & Power Co., Ltd., with a final dividend of 6 per cent, is maintaining the year's distribution at 10 per cent.

S. Guiterman & Co., Ltd., show a net profit of £24,424 for 1945 (against £31,743 for the previous year). An ordinary dividend of 10 per cent is recommended, plus a bonus of 5 per cent (same).

The Direct Spanish Telegraph Co., Ltd. proposes to pay a dividend of 4½ per cent (same). The net profit for 1945 was £6,014 (£5,967).

Joseph Lucas, Ltd., have declared an interim ordinary dividend of 2½ per cent (same).

New Companies

Cossor Radar, Ltd.—Private company. Registered March 23rd. Capital, £50,000. Objects: To acquire from A. C. Cossor, Ltd., all or part of that company's interest in any inventions, including radiolocation, radio transmission and reception, valves, domestic appliances and engineering equipment, etc. Directors: T. A. Macauley, Flat 41, 3, Grosvenor Square, W.1, and two others. Registered office: Cossor House, Highbury Grove, N.5.

Brown-Boveri (Ireland), Ltd.—Private company. Registered in Dublin March 19th. Capital, £5,000. Objects: To carry on the business of manufacturers of, and dealers in, electrical, mechanical and other machinery and apparatus, etc. Directors: J. G. Cassidy, 15, Wilfield Road, Ballsbridge, Dublin, and three others.

Cable Jointers, Ltd.—Private company. Registered February 27th. Capital, £500. Objects: To carry on the business of public works contractors, cable layers, builders, electrical and general engineers, etc. Directors: E. J. Daws, 6, Cavendish Avenue, Ealing, W.13, and two others. Registered office: 20, High Street, Pinner, Middlesex.

B.M.S. Laminations, Ltd.—Private company. Registered March 20th. Capital, £3,000. Objects: To carry on the business of manufacturers of, and dealers in, commutators and lamination plates used in the manufacture of dynamos, auto-starters and electric motors,

accumulator plates, accumulators, batteries, electrical plant, accessories, etc. Directors: H. Butler, 70, Sutton Road, Erdington, Birmingham, 23, and two others. Registered office: 167, Church Hill Road, Handsworth, Birmingham.

H.P.T. Electrical Installation Co., Ltd.—Private company. Registered March 22nd. Capital, £250. Objects: To carry on the business of electrical engineers and general installation contractors, lighting specialists, etc. Directors: E. H. Thompson, 49, St. Antony's Road, E.7, and two others. Registered office: 12 & 14, Upton Lane, Forest Gate, E.7.

Murray (Electricians), Ltd.—Private company. Registered in Edinburgh March 12th. Capital, £1,000. Objects: To carry on the business of electrical engineers and contractors, etc. Directors: G. Murray, 12, St. John Street, Prestwick, and R. S. Watt, 8, Blanefield Avenue, Prestwick. Registered office: 11, Alexander Avenue, Prestwick.

Taylor Electric Co. (Newport Pagnell), Ltd.—Private company. Registered March 14th. Capital, £2,000. Objects: To carry on business of television and wireless electricians, electrical and mechanical engineers, etc. Directors: F. W. Taylor, Fen Cottage, Braughton, Bucks, and L. S. Marler, The Towers, Wavendon, Bletchley. Office: 28, High Street, Newport Pagnell, Bucks.

H. Hughes (Electrical Engineers), Ltd.—Private company. Registered March 4th. Capital, £500. Objects: To acquire the business of an electrical contractor carried on by Herbert Hughes at Senartley, Deganwy Avenue, Llandudno. Directors: H. Hughes, 8, Deganwy Avenue, Llandudno, and two others. Registered office: 12, Lloyd Buildings, Llandudno.

J. B. Mackenzie (Edinburgh), Ltd.—Private company. Registered in Edinburgh March 2nd. Capital, £5,000. Objects: To acquire the business now carried on by J. B. Mackenzie, electrical engineer and contractor, at 72-4, Hanover Street, Edinburgh. Directors: J. B. Mackenzie and Mrs. E. M. Mackenzie, 23, Barnton Grove, Barnton, Midlothian. Registered office: 72, Hanover Street, Edinburgh.

Billage Electric Co., Ltd.—Private company. Registered March 8th. Capital, £4,000. Objects: To carry on the business of wholesale and retail vendors in, and manufacturers of, electrical appliances and articles of all kinds, etc. Directors: S. Billage, 78a, Ballards Lane, Finchley, N.3, electrical engineer, and three others. Registered office: 67, Woodhouse Road, North Finchley, N.12.

T. Mitchelson (Electrical) Ltd.—Private company. Registered March 12th. Capital, £1,000. Objects: To carry on the business of electrical engineers and contractors, etc. Directors: T. Mitchelson, 31, Orchard Gardens, Low Fell, Co. Durham, and H. Mitchelson, 21, Ashtrees Gardens, Low Fell, Co. Durham. Registered office: 22, West Street, Gateshead-on-Tyne.

Robson Electrical Products, Ltd.—Private company. Registered March 2nd. Capital, £1,000. Objects: To carry on the business of manufacturers of, dealers in, and repairers and hirers of, electrical and mechanical apparatus, accessories and components, and in particular wireless and radio sets and valves, etc. Subscribers: W. B. Robinson, 225, Northfield Road, King's Norton, Birmingham, 30, and J. Ashmore, 180, Birmingham Road, West Bromwich. Registered office: 41 and 43, Union Street, West Bromwich.

King Bros. (Electrical Enterprises), Ltd.—Private company. Registered March 9th. Capital, £100. Objects: To carry on the business of manufacturers of, and dealers in, dynamos, motors, armatures, magnetos, batteries, insulators, motor cars, etc. Directors: F. P. King, Homoko, Longmore Road, Liphook, Hants, and T. W. King, 109, Avondale Crescent, Grangetown, Cardiff. Registered office: 28a, Devonshire Street, W.1.

Saref Electrical Appliances, Ltd.—Private company. Registered March 8th. Capital, £2,000. Objects: To carry on the business of importers, exporters, wholesalers, electricians, mechanical engineers and manufacturers, workers of, and dealers in, electricity, manufacturers of telephones, telegraphs (wireless or otherwise), etc. S. R. Fatah, 1, Devonshire Square, E.C.2, signs as director. Registered office: 1, Devonshire Square E.C.2.

Roding Electric Co., Ltd.—Private company. Registered March 22nd. Capital, £100. Objects: To acquire the business carried on by John E. Griffiths and Jack M. Waring at 62, Lynn Road, Ilford, as the "Roding Electric Co." and to carry on the business of manufacturers of, and dealers in, electrical and radio goods, etc. Directors: J. E. Griffiths, 62, Lynn Road, Ilford, and J. Griffiths, 86, Victoria Avenue, Porthcawl. Registered office: 62, Lynn Road, Ilford, Essex.

Lighting & Heating (Wembley), Ltd.—Private company. Registered March 2nd. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, and repairers and hirers of, electrical and mechanical apparatus and accessories, and in particular wireless sets, radio sets and valves, etc. Directors: T. A. Robinson, 18, Northcote, Pinner, Middlesex, and F. C. Hill, "Stapleford," 587, Pinner Road, North Harrow, Middlesex. Registered office: 228, Preston Road, Wembley, Middlesex.

Mortgages and Charges

Barlite Lamps, Ltd.—Debenture, charged on the company's property, present and future, including uncalled capital, dated February 22nd, 1946, to secure £1,000. Holder: F. D. Parkinson, 23, Hastings Road, Thornton, Blackpool.

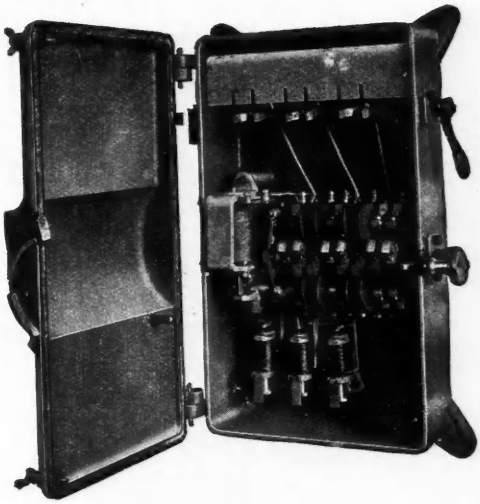
F. Fradley, Ltd.—Mortgage on land and 8 houses in course of erection at Stoke-on-Trent, dated February 18th, 1946, to secure £2,000 and further advances amounting therewith to £5,000 and further advances. Holders: Hanley Economic Building Society.

R. Marshall Carr, Ltd.—Satisfaction in full on February 19th, 1946, of mortgage or charge dated November 13th, 1935, and registered November 18th, 1935.

Bankruptcies

T. C. Cottrell, 31, Autumn Street, Burley Lodge Road, Leeds, electrician.—Discharge suspended for one month. Date of discharge, March 27th.

for control of squirrel-cage motors



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STOCKS AND SHARES

IT will be a good thing for everybody when the Budget is opened and its uncertainties are resolved. Awaiting its approach has a bad effect upon prices of stocks and shares. Taken in conjunction with problems raised by foreign politics, its influence over Stock Exchange markets as a whole has proved unfavourable. Rumour sports with the possibility of limitation of dividends, and this, in itself, has been sufficient to restrain activity.

Price Fluctuations

The declines in prices are of no great consequence amongst the groups with which these columns are concerned. Murex at 92s. 6d. have lost 2s. 6d. British Insulated Callender's 45s. 6d., Every Ready 48s. 6d., Enfield Cable 63s. 9d., Telegraph Construction 59s., Vactric 19s. 9d., are a little lower on the week. Crompton Parkinsons rose 1s. to 31s. 6d. Indian shares have rallied, Calcutta Electrics being 3s. 6d. up at 62s. 6d. and Calcutta Trams 1s. at 66s. 6d. Tokyo Electrics at 30½ have shed 4 points. The cable stocks are irregular, with Cable & Wireless ordinary 10s. higher at 96, the preference remaining heavy at 111. A rise of 9d. made Canadian Marconi 18s. 9d. Great Northern Telegraphs at 29 recovered 10s. of their previous loss. Globe Telegraph ordinary are easier at two guineas: the 6 per cent preference have hardened to 32s. 6d.

Home electricity supply shares are on the dull side. At all the recent annual meetings, the chairmen have sharply criticized the Government's nationalization proposals. Clyde Valley receded to 37s. 6d., a fall of 1s. 6d.

Radio Shares

Scophony 5s. shares have eased to 11s. and are now quoted ex-rights to the new shares offered last month to shareholders. The new shares are being dealt in at 6s. 3d. premium. Electrical & Musical Industries are firmer at 31s. 6d. A. C. Cossors are 9d. lower at 40s. Deccas remain moderately active around 61s.; the company's new 5 per cent preference shares are on offer at 23s., to yield £4 7s. per cent. There has been some interest in Ultra Electrics at 9s. 6d. on consideration of the yield of over 5 per cent on the 10 per cent dividends paid for the last three years. Pye deferred remain at 38s. 9d.; the preference are quoted at £2.

Ericsson Telephones

Ericsson Telephones have brought the distribution for the year up to 20 per cent tax-free for the fourth year running. The full accounts give another illustration of the way in which reduced liabilities under E.P.T. are assisting many companies to maintain net income in the face of lower trading profits during the reconversion period. On balance, Ericssons are left with £113,000 for distribution, against £117,000 the year before, although the trading profit after depreciation was £30,000 down. The dividend is again well covered. On a decline of $\frac{1}{16}$ the 5s. shares stand at 52s. 6d. Allowing for the dividend in the price, the yield works out at £1 18s. per cent net, or 3½ per cent less tax at 9s. The modesty of the yield on the shares is accounted for by the assumption of active trade for a long way ahead, and on hopes of a restoration of the dividend in due course to the pre-war level of 25 per cent tax free. Oriental Telephone is again paying 4 per cent for the year. The price is unchanged at 57s. 6d.

Preference Shares

Demand for electricity supply companies' preference shares has, of course, shown a marked revival since the Government assurances about the protection of this sort of capital in the event of nationalization. Investment is showing more readiness to pay fairly high premiums for preference shares in return for a yield in the region of 4½ per cent. Among shares in this category at present on offer are the 6 per cent issues of London Associated, Electricity Supply Corporation, and Edmundsons. The price in each case is within a few pence of 27s., at which the yield is £4 9s. per cent.

There remains a decided partiality for shares quoted near their par value. On the 4 per cent preference stocks of South Metropolitan and Mid-Cheshire Electric, both offered at 21s. 6d., the return is under 3¾ per cent. In the electrical equipment market, a line of G.E.C. 4½ per cent preference can be bought at 24s. to yield 3½ per cent; and Brush 5½ per cent preference are offered at 28s. 9d., at which the return is £3 16s. 6d. per cent. General Electric 6½ per cent preference have risen 1s. to 35s.

British Aluminium

For some time before the actual announcements, the market had been discounting a decrease in the British Aluminium profits and dividend for 1945. The price of the shares had fallen to under 40s. by the beginning of this year, and since the cut in the dividend from 10 to 8 per cent, it has been steady around 38s. 6d. The full accounts show that a substantial refund under the heading of E.P.T. offset to a large extent the decline in net trading profits. The decline is not explained in the report, but in advance of the annual meeting it was generally assumed that the problems attending transition from wartime to peacetime markets have been responsible. On the 8 per cent dividend the shares yield £4 3s. per cent on the money.

[In the notes in our issue of March 22nd it was stated that the new capital of Lancashire Dynamo & Crypto, Ltd., participated to the extent of three-fifths in the final dividend and bonus. This was incorrect: the three-fifths participation will be in the 1946 dividends.—Editors, *Electrical Review*.]

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

ADEL Precision Products Corporation.—"Conduit supporting block and bracket therefor." 18856/43. November 2nd, 1942. (575931.)

Akt.-Ges. Brown, Boveri & Cie.—"Steam power plant with particularly high superheating temperatures." 21489/43. December 22nd, 1942. (575935.)

Automotive Products Co., Ltd., and E. C. S. Clench.—"Motor devices of liquid pressure remote control systems." 373. January 7th, 1944. (576072.)

British Insulated Cables, Ltd., A. K. McKerrow and E. W. Mills.—"Manufacture of electric cables." 21402. December 21st, 1943. (576068.)

British Insulated Cables, Ltd., London Passenger Transport Board, J. Holland and T. C. Broom.—"Fittings for overhead electric traction systems." 19262. October 7th, 1944. (576017.)

British Thomson-Houston Co., Ltd.—"Methods of and apparatus for basing glass envelopes for electric lamps and similar electric devices." 2945/44. February 20th, 1943. (575946.) "Electron microscopes." 19991/43. December 1st, 1942. (576003.)

British Thomson-Houston Co., Ltd., and G. D. Sparrow.—"Apparatus for withdrawing single wires from a hopper adapted for use in the manufacture of electric lamps." 4829. March 15th, 1944. (575961.)

Chance Bros., Ltd., J. G. Holmes and J. English.—"Cathode ray bulbs." 5025. March 17th, 1944. (575962.)

F. W. T. Crowl.—"Collapsible handle, more especially for hand irons." 21401. December 21st, 1943. (576006.)

F. Dewhurst, and Baker Perkins, Ltd.—"Laundry ironing machines." 21751. December 28th, 1943. (576008.)

English Electric Co., Ltd., and K. G. Love.—"Means for operating trip free electric circuit breakers." 9477. May 17th, 1944. (575985.)

General Electric Co., Ltd., and M. W. Peirce.—"Dust-proof electric lighting installations." 7566. April 24th, 1944. (575975.) "Dust-proof electric lighting fittings." 7567. April 24th, 1944. (575976.)

W. T. Henley's Telegraph Works Co., Ltd., S. Maxwell and E. Moor.—"Electric cartridge fuses." 59. January 3rd, 1944. (575936.)

Incandescent Heat Co., Ltd., and J. Fallon.—"Furnaces heated by radiant tubular heating elements." Cognate applications 7379/44 and 14745/44. April 21st, 1944. (575973.)

Pressed Steel Co., Ltd., E. C. Rowledge and J. W. Kitson.—"Method of lubricating refrigerator compressors and the like." 18330. September 26th, 1944. (576016.)

D. Shaw.—"Braking systems for electrically-driven vehicles." 20481. December 7th, 1943. (576063.)

Soleator Soc. Anon.—"Vehicle lamps and other light projectors." 2727/44. January 21st, 1943. (575943.)

E. T. Timberlake.—"Dynamo-electric torque amplifiers." 15592. September 23rd, 1943. (576057.)

Welwyn Electrical Laboratories, Ltd., N. F. Robbie and E. H. Whitfield.—"Manufacture of electrical resistances." 5184. March 20th, 1944. (575963.)

B. I. Wood.—"Controls for electric heating appliances." 2921. February 16th, 1944. (575945.)

TRADE MARKS

THE following applications have been made for trade marks. Objections may be entered within a month from March 27th.

UNIMOLD (design). No. B634,442, Class 7. Sparking plug leads for the ignition apparatus of i.c. engines.—Titeflex, Inc., Newark, New Jersey. Address for service: c/o H. D. Fitzpatrick & Co., 94, Hope Street, Glasgow, C.2.

ASHTON. No. 627,808, Class 9. Electric cables and flexibles.—Aerialite, Ltd., Castle Works, Back Grosvenor Street, Stalybridge.

MEICO (design). No. 633,042, Class 9. Microphones, loudspeakers, amplifiers, radio and television receivers, radio transmitters, electronic testing equipment, and parts (not included in other classes) of all such goods; all for use in connection with public address equipment.—Micramatic Electrical Instrument Co., Ltd., 360, Station Road, Harrow.

MUZAK. No. 633, 418, Class 9. Records of sound, light or electric signals; and instruments and apparatus and parts thereof (not included in other classes) of the production of and reproduction of such records.—Rediffusion, Ltd., Victoria Station House, Victoria Street, London, S.W.1.

T (design). No. 634,777, Class 9. Electric flow rate indicators, etc.—Tecalamit, Ltd., Great West Road, Brentford.

STABILISTOR. No. B636,268, Class 9. Voltage regulating apparatus.—Westinghouse Brake & Signal Co., Ltd., 82, York Way, King's Cross, London, N.1.

EGA (design). No. 636,945, Class 9. Electric kitchen utensils included in Class 9; flexible conductors, resistances, switches, bells, buzzers, coils, batteries, transformers, fuses, soldering irons, smoothing irons, terminals, contacts and connections. Also No. 636,944, Class 11. Electric heating apparatus, lamps, fans, stoves, radiators, electric kitchen utensils included in Class 11, and immersion heaters.—Electrical & General Accessories (Leicester), Ltd., 7, Newhall Street, Birmingham, 3.

MASTRAL. No. 637,178, Class 9. Electroplating apparatus and instruments.—Kingsland Engineering Co., Ltd., 106-108, Kingsland Road, London, E.2.

APEX. No. 638,184, Class 10. Hearing aids for the deaf, and parts thereof not included in other classes.—Alfred Peters & Sons, Ltd., National Provincial Bank Chambers, Montpellier, Cheltenham.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where " Contracts Open " are advertised in our " Official Notices " section the date of the issue is given in parentheses.

Abertillery.—April 19th. Electricity Department. Electrical stores and materials for twelve months. (See this issue.)

Australia. — June 13th. Sydney County Council. Steam, feedwater and other piping, valves, etc., for Pyrmont " B " power station.

Bromley.—April 10th. Electricity Department. Cables and transformers. (March 22nd.)

Burnley.—April 15th.—Electricity Department. Cables and transformers. (See this issue.)

Hastings.—April 15th. Electricity Department. One 11-kV three-phase outdoor type switch kiosk. (March 29th.)

Kettering.—April 29th. Electricity Department. One 400-kVA, one 350-kVA, one 6,000-kVA and two 500-kVA transformers. (March 29th.)

Leeds.—May 4th. Transport Committee. Automatic mercury arc rectifier equipment, with switchgear. (March 29th.)

New Mills.—April 19th. Electricity Department. L.v. cables and feeder pillars. (March 29th.)

North of Scotland.—April 22nd. Hydro-Electric Board. Submarine power cables in Bute and South Cowal area. (March 29th.)

April 29th. H.v. and l.v. overhead lines in Island of Islay, Argyllshire. (See this issue.)

May 2nd. H.v. and l.v. overhead lines and underground cables in Millport, Island of Great Cumbrae, Buteshire. (See this issue.)

Rotherham.—April 20th. R.D.C. Electrical wiring of the Council's houses. (March 29th.)

Rugby.—April 12th. Electricity Department. Electrical stores and materials. (See this issue.)

Sheffield.—June 3rd. Electricity Department. Steam generators together with all associated equipment for the Neepsend generating station. (See this issue.)

Southend-on-Sea.—April 11th. Corporation. One 250-kW •back pressure steam generating alternator set. (March 29th.)

Orders Placed

Brighton.—Electricity Committee. Accepted. Eight 500-kVA transformers (£2,968).—Lindley Thompson Transformer & Service Co.

Darlington.—Town Council. Accepted. Switchgear (£1,163).—A. Reyrolle & Co.

Hammersmith. — Electricity Committee. Recommended. Rubber - insulated cables (£1,893).—Sloan Electrical Co E.h.v., h.v. and l.v. cables (£20,413).—Henley's. Cooker cable (£225).—Pirelli-General.

Morecambe.—Electricity Committee. Cable for a further eleven months.—W. T. Glover & Co.

Stockton-on-Tees.—Corporation. Accepted. Cables for the Darlington Lane housing site (£8,676).—Edison Swan Cables.

Stranraer.—Town Council. Accepted. Electrical work at 126 houses (£3,637).—Miller & Stables.

Tynemouth.—Housing Committee. Acepted. Wiring and fittings in 132 houses on estates (£3,770).—Bonham Electrical & Engineering Co.

Watford.—Electricity Committee. Accepted. Three 500-kVA transformers (£1,645) and two 750 kVA transformers (£1,522).—Metropolitan-Vickers. Three circuit-breakers (£272).—J. G. Statter & Co.

Water Committee. Accepted. Re-wiring at pumping station (£497).—J. W. Russell.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ashington.—Electrical work for 54 houses in Woodhorn Road; U.D.C. surveyor.

Astley.—Houses (42), Green Lane and Monklands Road; Green & Co., builders, Highfield, Linjards Lane, Atherton.

Audenshaw.—Extensions, grammar school; E. C. Coleman, Ltd., builders, Waverley Road Works, Sale, Cheshire.

Bellingham (Northumberland).—Electrical installations in 42 houses; W. Dixon & Son, architects, 1,Collingwood St.,Newcastle-on-Tyne.

Birkenhead.—Three-storey residential flats, off St. David's Road and St. Alban's Road; Rees & Holt, architects, 64, Rodney Street, Liverpool.

Bournemouth.—Houses (74), Kinson estate; borough architect, Town Hall.

Ceiriog.—Houses (86), Hand Hotel site, for R.D.C.; F. A. Roberts, architect, Earl Chambers, Mold, Flintshire.

Coupar Angus.—Houses (55), with electrical work; A. F. Laing, town clerk, Town Buildings.

Croydon.—Works additions, 445, Brighton Road; South Croydon Engineering Works, Ltd.

Cuckfield.—Houses (70), Three Bridges, for R.D.C.; A. Hutchings, surveyor, Boltro Road, Haywards Heath.

Dalkeith.—Houses (64); A. Forrester, architect, Municipal Buildings.

Denby Dale.—Houses (42), for U.D.C.; Simpson & Moxon, architects, Southgate Chambers, Wakefield.

Dornoch.—Houses (22), for Town Council; burgh surveyor, Library Buildings.

Dundee.—Factory, Camperdown, for National Cash Register Co.; J. Stanley Beard & Bennett, architects, London.

Exeter.—Houses (134), Pinhoe Road site; and clinic, Pilton House, Richmond Road; city architect.

Garforth.—Houses (56), Oak estate; R. A. Easedale & Son, architects, Castleford.

Gateshead-on-Tyne.—Factory, Team Valley Trading Estate for Jules Coppe, Ltd.; W. Hall & Sons, Derwentwater Rd., Gateshead-on-Tyne.

Factory, Tyneside Safety Glass Co.; Hadden & Hillman, Ltd., 127, New Bridge Street, Newcastle-on-Tyne.

Preliminary training school, Queen Elizabeth Hospital (£26,000); borough engineer.

Glasgow.—Factory, 163, Millerfield Road, for Scottish Wool Flock Co., Ltd.; T. S. Cordiner, architect.

Houses (126), Craigton estate (£144,342); L. K. MacKenzie & Partners, Ltd.

Heaton Chapel.—Houses (73), Ashford Road and Hartwell Avenue; J. H. Whitfield, Ltd., builders, 16, Lea Rd., Heaton Moor, Stockport.

Hetton.—Houses (50), Low Moorsly; J. Prentice, builder, St. Nicholas Av., Sunderland.

Heywood.—Bungalows (40), Stand Lees Farm, Ashworth; Walkers (Prestwich), Ltd., builders, 2, Beech Tree Bank, Prestwich, Manchester.

Horsham.—Houses (32), West Street, Billingshurst, for R.D.C.; Godman & Kay, architects, Bank Chambers.

Hucknall. — Houses (54), Ruff's estate (£60,036); Allcock & Sissons, builders, Hill Top, Eastwood, Notts.

Hulme.—Garment factory, River Street; Alexander's Waterproof Co., 39, City Road, Hulme, Manchester, 15.

Hyde.—Works extensions, Gordon Street; E. Peart & Co., Ltd.

Knutsford.—Houses (48), Heathfield Drive; G. R. Butler, surveyor, U.D.C. Offices.

Jarrow.—Electrical installations in 50 houses; borough engineer.

Lanarkshire.—Houses (120), at Calderbank and Bargeddie (£133,335); Whatlings, Ltd., Glasgow.

Langley Moor (Co. Durham).—Hosiery factory, for Woodhouse & Smith, Ltd.; F. Hedley, architect.

Linslade.—Houses (30), Southcott site; H. A. Rolls, architect, 15, Bridge Street, Leighton Buzzard.

Longbenton (Northumberland).—Electrical installations in 94 houses; U.D.C. surveyor.

Milngavie.—Houses (100); F. A. B. Preston, burgh surveyor's office, 6, Buchanan Street.

Nairn.—Houses (68), for Town Council; burgh surveyor.

Newcastle (Staffs).—Saw mill; G. A. Forster, Apedale Road, Chesterton, Staffs.

Newcastle-on-Tyne. — Foundry and office, Glasshouse Street, for British Engines, Ltd.; R. Bowey, builder, Raby Street.

Houses (36) in flats; J. J. Hedley, Oxford St.

Newport (Mon.).—Extensive developments, Courtybella Works; Whitehead Iron & Steel Co., Ltd.

Northfleet. — Houses (28), Perry Street (£29,670); D. Kenn & Sons, Ltd., builders, Bexley.

North Shields.—Factory, for Tyne Plywood. Ltd., Norham Road; Cotton, Ballard & Blow,

Factory, Norham Road, for British Die Casting & Engineering Co.; G. H. Gray.

Oban.—Wool mill; J. McDonald, Stornoway

Sawbridgeworth. — Factory, Rowneybury; Baldwin Chemical Industries.

Scarborough.—Alterations, Cambridge Hotel and Hydro, Ramshill Road, South Cliff (£15,000); secretary.

Scunthorpe. — Extensions, food factory (£10,000); Snack Food Products, Ltd., Doncaster Road.

Sleaford.—Houses (68), Woodside estate; F. J. Lenton, architect, 16, Broad Street, Stamford.

Southgate.—Permanent houses (76), Barrowell Green (£84,936); Kent & Sussex Contractors, Ltd., Carlton Road, Erith.

Flats (42), Green Lanes and Hoppers Road; R. H. Brine, 121, Green Street, Sunbury-on-Thames.

Factory extensions, Telford Road, for Hobarts Manufacturing Co.; E. H. Firmin.

Stafford.—Junior and infants' school, Riding Brook; A. C. H. Stillman, county education architect, County Offices.

Stockport.—Ambulance station; H. S. Fairhurst & Son, architects, Chancery Chambers, 55, Brown Street, Manchester, 2.

Houses (105), Woodlands estate; J. Foulkes & Sons, builders, Wickens Street, Offerton Lane.

Stoke Newington.—Flats (76), Milton Grove; borough engineer.

Stoke-on-Trent. — Out-patients' department and additional engineering plant, Burslem, Haywood and Tunstall War Memorial Hospital; A. Saxon Snell & Rees Phillips, architects, 9, Bentinck Street, London, W.1.

Sunderland.—Houses (384), Thorney Close estate; borough engineer.

Surbiton.—Houses (120), Mansfield Road estate, Hook; R. Thirlway, architect, Council Offices, Ewell Road.

Sutton Coldfield.—Permanent houses (66), Tower Road estate; borough surveyor, Council House.

Warrington.—Houses (50), Capesthorne Road; W. A. Howard, builder, Lindi, Knutsford Road, Grappenhall, Warrington.

Wingerworth.—Houses (240), off Derby Road; J. Adlington, Ltd., builders, Halcyon, Station New Road, Tupton, Derbyshire.

New Light Source

A NEW arc lamp recently demonstrated in the Western Union Telegraph Co.'s laboratory on Long Island, New York, where it was developed, is said to be of a brilliance fully equal to one-half that of the sun.

According to *Reuter's Trade Service* the almost microscopic points of light are emitted from a crater of molten metal (zirconium) only three one-thousandths of an inch in diameter while the new " lamp " is said to be no larger than the smallest valve used in the average household wireless set. It may be useful for the illumination of high-magnification microscopes, as a source of intense ultra-violet radiation for medical needs, or as a lens-less projector of much greater brilliancy and longer life than tungsten lamps.